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Section 27. Biophysics, Bioengineering and Medical Instrumentation

CONTENTS PAGE

1. GENERAL ASPECTS	589	6.7. Circulation	619
1.1. History	-	6.8. Respiration	623
1.2. Components	589	6.9. Reproductive system	624
1.3. Standards	589	6.10. Urinary tract	625
2. BIOPHYSICS AND BIOENGINEERING	589	6.11. Nervous system	625
2.1. Fundamental concepts	592	6.12. Receptors	626
2.2. Mechanical systems	593	6.13. Locomotor apparatus	628
2.3. Heat and thermodynamics	594	6.14. Skin	629
2.4. Bioacoustics	595	6.15. Aerospace medicine	-
2.5. Biooptics	596	6.16. Work and sport	629
2.6. Gas physics	-	6.17. Radiology	630
2.7. Fluid flow systems	597	6.18. Anesthesia	635
2.8. Electrical systems	598	6.19. Monitoring	-
2.9. Nuclear biophysics	600	7. SURGICAL INSTRUMENTS	-
3. GENERAL INSTRUMENTATION	601	8. NEW INSTRUMENTS	-
3.1. Transducers	602	9. COMPUTER APPLICATIONS	636
3.2. Amplifiers	602	9.1. Hospital automation	636
3.3. Indicators	603	9.1.1. Laboratory techniques	636
3.4. Recorders	603	9.1.2. Administration	-
3.5. Generators	603	9.1.3. Pharmacy	-
3.6. Telemetric devices	603	9.2. Medical history	637
3.7. Data loggers	-	9.3. Clinical diagnosis	638
3.8. Cameras	604	9.4. Electrodiagnosis	638
4. COMPUTERS	606	9.4.1. Electrocardiography	-
4.1. Averagers	-	9.4.2. Electroencephalography	638
4.2. Analog computers	606	9.4.3. Electromyography	638
4.3. Digital computers	607	9.4.4. Electroretinography	-
4.4. Hybrid computers	-	9.5. Patient monitoring	-
5. SPECIFIC MEASUREMENTS	607	9.6. Drug treatment	-
5.1. Temperature measurement	607	9.7. Radiology	639
5.2. Time measurement	-	9.8. Medical record documentation	645
5.3. Frequency measurement	608	9.9. Literature documentation	645
5.4. Pressure measurement	608	9.10. Function tests and techniques	645
5.5. Flow measurement	609	9.10.1. Blood circulation	645
5.6. Flow resistance measurement	-	9.10.2. Respiratory system	646
5.7. Volume measurement	-	9.10.3. Nervous system	646
5.8. Density measurement	609		
5.9. Acceleration measurement	-		
5.10. Displacement measurement	609		
5.11. Electrical phenomena	610		
5.11.1. Electrical activity measurement	-		
5.11.2. Impedance measurement	610		
5.12. Gas concentration measurement	610		
5.13. Hydrogen ion concentration measurement	-		
5.14. Radiation measurement	612		
5.14.1. Visible light	612		
5.14.2. Ultraviolet radiation	613		
5.14.3. Infrared radiation	613		
5.14.4. Radiowaves	614		
5.14.5. Roentgen radiation	615		
5.14.6. Alpha, beta and gamma radiation	616		
5.14.7. Neutrons	617		
5.14.8. Cosmic radiation	617		
5.14.9. Sound	617		
6. SPECIALIZED INSTRUMENTATION	618		
6.1. Metabolism	618		
6.2. Thermoregulation	618		
6.3. Digestive tract	619		
6.4. Liver and bile ducts	-		
6.5. Blood	619		
6.6. Lymphatic system	-		

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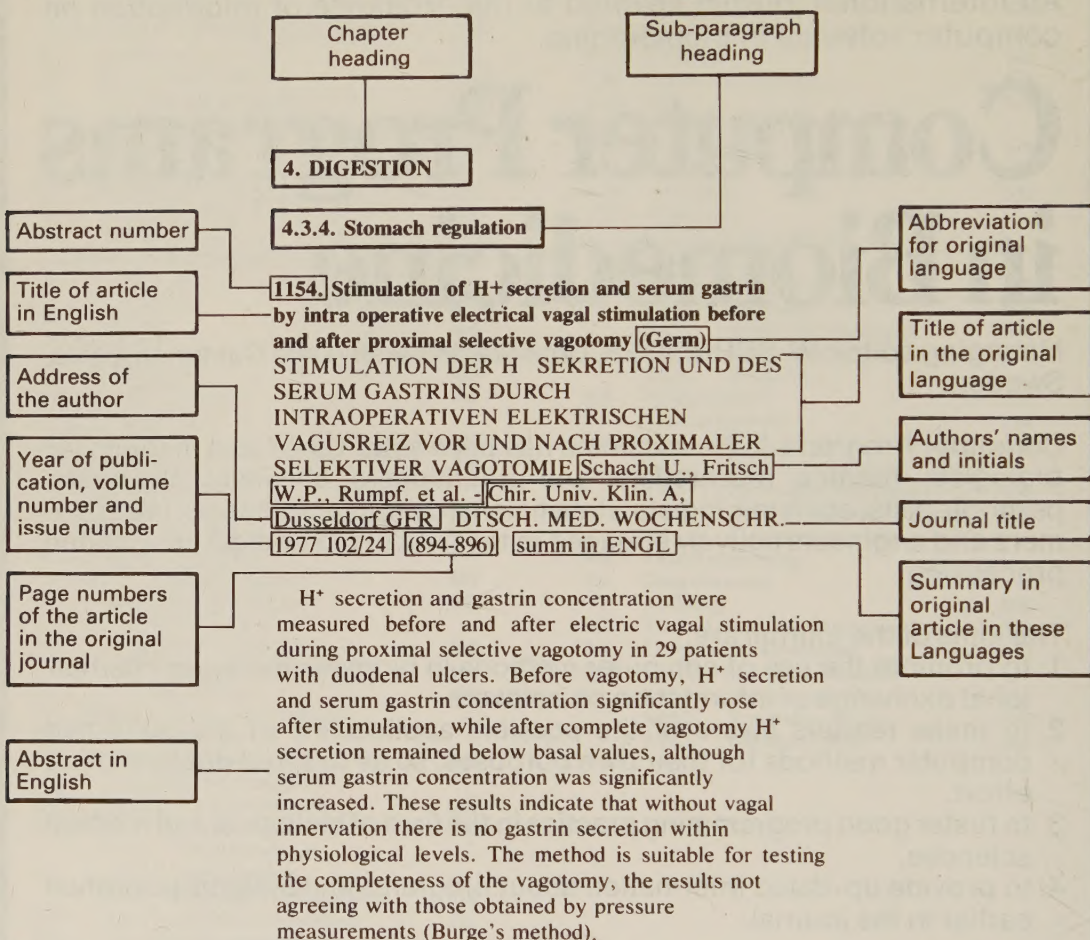
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1. GENERAL ASPECTS

1.2. Components

3486. Wear of combinations of acrylic resin and porcelain, on an abrasion testing machine - Harrison A. - Dept. Restorative Dent., Dent. Sch., Univ. Wales, Cardiff GBR - J. ORAL REHABIL. 1978 5/2 (111-115)

Wear tests of various combinations of acrylic resin and porcelain were made using a machine which was designed to test materials under conditions similar to those of masticatory function by simulating the loads, sliding distances, and contact times encountered in the human masticatory cycle. The results showed that the amount of wear of the two materials worn in combination depended on the nature of the surrounding medium and on the surface roughness of the opposing material. Acrylic resin showed good wear resistance provided no third party abrasive or opposing hard, rough surface was present. When a mild abrasive was incorporated in the system, the acrylic resin vs acrylic resin combination wore almost seven times more than porcelain vs porcelain. Clinical experience would suggest that this is a reasonably sound order of wear.

3487. Novel disc-motor designs - Eastham J. and Evans P.D. - Sch. Electr. Engin., Univ. Bath BA2 7AY GBR - PROC. INST. ELECTR. ENG. 1978 125/5 (416)

Traditional methods of disc-motor construction usually require the slots to be machined into a strip-wound circular core. Alternative disc-motor configurations are suggested which appear to overcome this problem. They permit the use of prepunched laminations for construction of the stator and rotor cores.

1.3. Standards

3488. Behavioral effects in monkeys exposed to extremely low frequency electromagnetic fields - De Lorge J.O. and Grissett J.D. - Nav. Aerospace Med. Res. Lab., Nav. Air Stat., Pensacola, Fla. 32508 USA - INT. J. BIOMETEOROL. 1977 21/4 (357-365)

Several experiments with rhesus and squirrel monkeys on the influence of extremely low frequency (ELF) electromagnetic fields found no effects on behavior. Magnetic fields of 0.3 and 1.0 mT with electric fields of below 1 to 29 V/m at frequencies of 7, 10, 15, 45, 60 and 75 Hz were used. Small differences in ambulatory activity and response rate were occasionally observed, but no consistent effects between or within animals on any measures were obtained. No effects on reaction time, interresponse time, match-to-sample performance, and blood constituents were observed. Such previously reported effects may not be a consequence of ELF values alone, but are probably related to other environmental variables.

3489. Analysis of the microstrip and the electrooptic light modulator - Kobayashi M. - Dept. Electr. Engin., Fac. Engin., Ibaraki Univ., Ibaraki JPN - IEEE

TRANS. MICROWAVE THEORY TECH. 1978 26/2 (119-126)

Green's function for examples with anisotropic media is obtained using the image-coefficient method. The method is based on the boundary conditions and the reciprocity relation. Using this Green's function and solving directly the charge distribution on the strip, the line capacitances per unit length of a microstrip and of an electrooptic light modulator are obtained. High accuracy of this results obtained using the conformal mapping and with other data appeared in the literature. The charge distributions are also illustrated. Of particular interest is the effective filling fraction of the dielectric material, which depends mainly on the shape ratio and only slightly on the relative dielectric constant. The effective filling fractions are tabulated for the microstrip with a homogeneous dielectric substrate.

3490. Sulfur as a proposed near infrared reflectance standard - Tkachuk R. and Kuzina F.D. - Grain Res. Lab., Canadian Grain Commiss., Winnipeg, Manitoba R3C 3G9 CAN - APPL. OPT. 1978 17/17 (2817-2820)

Powdered sulfur pressings were found to have uniform and high diffuse reflectances of approximately 97-98% in the region between 1.0 μm and 2.5 μm . The reflectance and physical properties of powdered sulfur indicate that it could be used as a reflectance standard in the near ir region.

2. BIOPHYSICS AND BIOENGINEERING

3491. Use of bipolar membranes for generation of acid and base. An engineering and economic analysis - Nagasubramanian K., Chlanda F.P. and Liu K.J. - Corporate Chem. Res. Cent., Allied Chem. Corp., Morristown, N.J. 07960 USA - J.MEMBR.SCI. 1977 2/2 (109-124)

Bipolar membranes, the two component parts of which are selective to ions of opposite charge, are capable of separating and concentrating hydrogen and hydroxyl ions from water molecules at high efficiency. Used in conjunction with cation- and anion-selective membranes, the electrically driven process generates acids and bases from their salts. An engineering and economic analysis of the process is presented here and compared with the conventional electrolysis process. The conditions under which the water splitting process can be economically attractive are outlined and discussed.

3492. Use of a mathematical model for neurovirulence assay of attenuated poliovirus - Arya S.C. - Nat. Inst. Communic. Dis., Delhi IND - J. BIOL. STAND. 1977 5/4 (283-287)

A model applicable to both intraspinal and intracerebral routes, based on the enumeration of foci of neuronal damage at the site of injection and in areas localized away from the injection site, was employed to evaluate neurovirulence of 4 attenuated poliovirus bulk suspensions. The model involves the test of significance on the ratios of foci of neuronal destruction and the number of valid monkeys obtained with the test material and the homotypic reference virus

preparation. One type I bulk suspension failed to pass the neurovirulence test as a result of significantly increased spread of the virus activity from the injection sites in the lumbar cord and in the thalamus. After injection by the intraspinal route, the red nucleus and lateral vestibular nucleus showed the maximum damage although the intracerebral injections damaged the cervical and lumbar cord, dentate nucleus and lateral vestibular nucleus.

3493. Stabilization of bilayer lipid membranes by polymers (Russ) - Shchipunov Yu.A. - Inst. Chem., Far East. Res. Cent., Acad. Sci. USSR, Vladivostok SUN - BIOFIZIKA 1978 23/1 (161-162) - summ in ENGL

Bilayer lipid membranes on the bases of monoglyceride of oleic acid with the inclusion of polystyrene are described. The inclusion of the polymer allows to obtain highly stable membranes without significant changes in the nature of their conductivity.

3494. An automated procedure for correlation of Q-sorts - Dibb G.S. and Alexander B.K. - Univ. Hawaii, Honolulu, Haw. USA - PERCEPT. MOT. SKILLS 1977 45/3 II (1264-1266)

A set of computer programs which calculates correlations between Q-sort decks is described. These programs automatically process Q-sort decks in which the items are printed directly on IBM cards, thus enabling the rapid analysis of large volumes of Q-sort data. An application of this method to the assessment of family interaction is described.

3495. Mathematical model of the adaptation of energy metabolism of the cell. Effect of ATP on the activity and concentration of the enzyme of the initiator stage - Kaimachnikov N.P. and Selkov Ye.Ye. - Inst. Biol. Phys., USSR Acad. Sci., Pushchino SUN - BIOPHYSICS 1977 22/2 (246-252)

To study the phenomenon of adaptation of cell energy metabolism to changing loads the authors consider a simple kinetic model of energy metabolism. In this model the initiator stage of energy metabolism - the stage at which the initial substrate S is activated through the energy of the ATP molecules - is catalysed by the oligomeric enzyme E capable of dissociating at high ATP concentration into the monomers E_1 . It is assumed that the steady level of the monomers E_1 in the cell is maintained by the constitutive synthesis of molecules E_1 which balances their continuous hydrolysis by proteases. The properties of the kinetic model are investigated with the aid of a mathematical model - a set of non-linear differential equations describing the change with time in the total concentration of the enzyme E and ATP. The main isoclines of this system may intersect at one, two or three points. Investigation of the system shows that the kinetic model considered has adaptive properties. In response to sharp increase in the activity of ATPase a transitional process appears in the model leading to increase in the total concentration of the enzyme E and rise in the 'power' of energy metabolism as a result of which [ATP] falls only insignificantly. The establishment of the new level [E] may be of an oscillatory character.

3496. A model of quick phase generation in the vestibuloocular reflex - Chun K.S. and Robinson D.A. - Dept. Elect. Engin., Johns Hopkins Univ., Baltimore, Md. USA - BIOL. CYBERN. 1978 28/4 (209-221)

The vestibuloocular reflex of the cat was studied during step and sinusoidal head velocity stimuli. A model is presented which simulates the observed slow phase and quick phase behavior. The model is constructed to be compatible with neurophysiological observations of the behavior of neurons in the pons. Emphasis is placed on the amplitude and timing of quick phases which are active orienting movements that drive the eyes into the direction of turning. It is proposed that quick phases, like saccades, are generated by a local feedback loop in the pons which rapidly drives the eyes to a point in the orbit specified by a vestibular signal. It is suggested that two internal signals specify the eye positions at which quick phases start and end. The statistics of the fluctuations of these signals was measured and correlation between them was discovered and incorporated in the model.

3497. Mathematical simulation of some information processes connected with recognition and formation of concepts (Russ) - Farmakovskiy V.V. - Res. Inst. Appl. Mathemat. Cybernet., Gorky SUN - BIOFIZIKA 1978 23/2 (360-363) - summ in ENGL

The connection of recognition and image formation processes was investigated at an experimental level. It is shown how to use the existence of such a connection for describing these processes within a single mathematical model.

3498. A program to simulate drug elimination interactions: warfarin and BSP - an illustrative example - Luecke R.H. and Wosilait W.D. - Dept. Chem. Engin., Univ. Missouri, Columbia, Mo. USA - COMPUT. PROGRAMS BIOMED. 1978 8/1 (35-43)

The kinetics of drug elimination in interactive drug systems is simulated by a set of differential equations based on mass balances, the mass of organs and blood flow rates. Experimentally determined concentration profiles of the drugs in the plasma and bile are used to evaluate clearance rate parameters. An example is shown in which the clearance of the anticoagulant warfarin is reduced to less than 50% of its normal rate due to the interference by BSP.

3499. An optimization model for influenza A epidemics - Longini I.M. Jr., Ackerman E. and Elveback L.R. - Div. Health Computer Sci., Mayo Mem. Bld., Univ. Minnesota, Minneapolis, Minn. 55455 USA - MATH. BIOSCI. 1978 38/1-2 (141-157)

A deterministic model is developed to describe a single wave of influenza A in a closed stratified population. The model specifies agent characteristics and nonhomogeneous mixing patterns among various age groups in a standardized American community. Attack rates predicted by the model for the Asian and Hong Kong strains of influenza are found to agree with those predicted by a previously described stochastic simulation model. The deterministic model is then coupled with an optimization formulation which selects the optimal vaccine distribution pattern among

the various age groups when there is a limited quantity of vaccine available. Optimal vaccine distribution patterns are given. These patterns are found to vary, depending on the particular strain of influenza A modeled, the quantity of vaccine available, and the 'cost' structure of the objective function.

3500. Development of a model for research on occupational accidents - Andersson R., Johansson B., Linden K. et al. - Dept. Soc. Prev. Med., Lunds Univ., S-22185 Lund SWE - J. OCCUP. MED. 1978 1/4 (341-352)

In connection with an epidemiological survey of occupational accidents, based on case studies at the Malmo General Hospital in the spring of 1974, the authors found deficiencies in the existing research models, especially concerning clarification of the causal pattern. Through development of J. Surry's model, modified by the Swedish Work Environment Fund, they created a model, which by summarizing and generalizing knowledge gained through separate observations, leads to a general knowledge of the work process and the likelihood of changes in its stability. Conversely, when this general knowledge is present, the model is able to provide a relevant body of knowledge about the work process which is necessary for a correct explanation of the objective danger and the individual's confrontation with this.

3501. Voltage gated cation conductance channel from fragmented sarcoplasmic reticulum: Steady state electrical properties - Miller C. - Grad. Dept. Biochem., Brandeis Univ., Waltham, Mass. 02154 USA - J. MEMBR. BIOL. 1978 40/1 (1-23)

The interaction of fragmented sarcoplasmic reticulum (SR) with an artificial planar phospholipid membrane under conditions known to induce fusion of phospholipid vesicles raises the conductance of the planar bilayer by several orders of magnitude. Measurements of steady-state electrical properties of bilayers thus modified by SR show that 2 types of conductance pathways are present. One is a voltage-independent pathway which may be somewhat anion-selective. The other is a voltage-gated ionophore showing selectivity to small monovalent cations. This latter ionophore is fully oriented within the artificial bilayer and is inhibited asymmetrically by divalent cations. It is also inhibited below pH 6. The ionophore displays single-channel conductance fluctuations between 2 states, 'open' and 'closed', with an open-state conductance of 1.4×10^{-10} mho in 0.1 M K^+ . The physiological function of this ionophore is unknown.

3502. Some observations on the physical realizability of compartmental models with delays - Cobelli C. and Rescigno A. - Lab. Theoret. Biol., Nat. Cancer Inst., Bethesda, Md. 20014 - IEEE TRANS. BIO-MED ENG. 1978 25/3 (294-295)

Often a compartmental model must include delays to fit the experimental observations. The resulting dynamical equations are difference-differential equations and must satisfy certain conditions if they represent a physically realizable system. The physical realizability of two compartmental models with delays

is discussed.

3503. Prediction of pilot-aircraft stability boundaries and performance contours - Stengel R.F. and Broussard J.R. - Anal. Sci. Corp., Reading, Mass. 01867 USA - IEEE TRANS. SYST. MAN CYBERN. 1978 8/5 (349-356)

Control-theoretic pilot models can provide important new insights regarding the stability and performance characteristics of the pilot-aircraft system. Optimal-control pilot models can be formed for a wide range of flight conditions, suggesting that the human pilot can maintain stability if he adapts his control strategy to the aircraft's changing dynamics. Of particular concern is the effect of suboptimal pilot adaptation as an aircraft makes transitions from low to high angles of attack during rapid maneuvering, as the changes in aircraft stability and control response can be extreme. The effects of optimal and suboptimal effort during a typical 'high-g' maneuver are examined, and the concept of minimum-control effort (MCE) adaptation is introduced. Limited experimental results tend to support the MCE adaptation concept.

3504. A model of human decisionmaking in a fault diagnosis task - Rouse W.B. - Coordinated Sci. Lab., Dept. Mechan. Industr. Engin., Univ. Illinois, Urbana, Ill. 61801 USA - IEEE TRANS. SYST. MAN CYBERN. 1978 8/5 (357-361)

Utilizing elementary concepts from the theory of fuzzy sets as well as several nonfuzzy heuristics, a model is presented of human decisionmaking in the task of troubleshooting graphically displayed networks. The performance of the model is compared to the results of two previously reported experimental studies. The ability of the model to represent human decisionmaking as a function of network size, forced-pacing, and computer aiding is considered.

3505. New TiO(x)-MIS and SiO₂-MIS silicon solar cells - Van Halen P., Mertens R.P., Van Overstraeten R.J. et al. - Dept. Elektrotechn., Kathol. Univ. Leuven, B-3030 Heverlee BEL - IEEE TRANS. ELECTRON DEVICES 1978 25/5 (507-511)

Two new types of solar cells are described in which either a TiO(x) or a SiO₂ layer is deposited onto p silicon; contacts are obtained by means of a MIS tunnel diode grid. It is shown that the TiO(x)-MIS cells can be realized by single-mask completely low-temperature processing by employing spin-on of titanium-oxide antireflective coating. Conversion efficiencies of 8% at AM1 have been achieved with these cells; they perform even more efficiently at higher illumination levels. With the SiO₂-MIS cells efficiencies of 12% have been reached, at the expense of a slightly more complicated process. A detailed comparison between the 2 cells is given.

3506. Using sensitivity analysis to simplify ecosystem models: A case study - Rose M.R. and Harmsen R. - Populat. Developm. Biol. Group, Univ. Sussex, Brighton BN1 90G GBR - SIMULATION 1978 31/1 (15-26)

In this paper the authors propose a way of moving

from a complex simulation model based on the 'mechanics' of an ecosystem to a much simpler model that exhibits behavior similar to that of the original model in its major features. The tool used to isolate the key characteristics of the original model is sensitivity analysis. It enables the investigator to identify the variables and parameters that determine the essential behavior of the original model and to formulate a clear picture of that behavior. With this information in hand, the investigator can devise a simplified model that exhibits the same essential behavior.

3507. Linking environmental models with models of human judgment: A symmetrical decision aid - Hammond K.R., Mumpower J.L. and Smith T.H. - Inst. Behav. Sci., Univ. Colorado, Boulder, Colo. 80302 USA - IEEE TRANS. SYST. MAN CYBERN. 1977 7/5 (358-367)

Policy formation involves the interaction of two systems, the environmental system and the human cognitive system which attempts to form a judgment about it. At present, the interaction between these two systems is not under rational control. That is, although interactive computer models of environmental systems have been constructed and are in increasing use, and interactive computer models of human judgment have been constructed and have been found to be of practical use, links between the two until recently have not been considered. The specific aim of this article is to describe such a link for the purpose of developing an aid for planners and policy makers.

2.1. Fundamental concepts

3508. Control for some approximations to chain-binomial epidemic models - Dayananda P.W.A. and Hogarth W.L. - Sch. Australian Environm. Studies, Griffith Univ., Nathan AUS - MATH. BIOSCI. 1977 35/1-2 (151-163)

A policy of immunization is considered for the Greenwood and Reed-Frost chain-binomial epidemic models. In the case of the Reed-Frost model the assumption is made that the probability of contact between two individuals is either small or large. The principle of optimality is used to derive programming equations for both deterministic and stochastic versions of these models. Optimal immunization policies together with corresponding optimal costs are presented.

3509. Optimal control of a deterministic epidemic - Bobisud L.E. - Dept. Mathemat., Univ. Idaho, Moscow, Id. 83843 USA - MATH. BIOSCI. 1977 35/1-2 (165-174)

Optimal control by immunization of a general deterministic model of an epidemic is examined when cost is measured by the maximum number of infectives plus a measure of the control effort expended. Results guaranteeing that the optimal control has one switch are presented, as are conditions under which the optimal control is to allow the epidemic to run its course unchecked. Optimal control by more efficient removal of infectives is also considered.

3510. Physical aspects of tissue evagination and biological form - Gierer A. - Max Planck Inst. Virusforsch., Tübingen GBR - Q. REV. BIOPHYS. 1977 10/4 (529-593)

The form of multicellular animals and their organs is mainly defined by the curvature of cell layers. They are boundaries for solid tissues; and some organs and organisms consist mainly of distinct cell layers. The form of adult organisms results from a complex interplay of tissue evagination, growth patterns, production of and interaction with extracellular material, and other effects; but the rudiments and basic features of the forms produced can often be traced back to processes of evagination or invagination of nearly flat cell sheets at defined location in the course of embryogenesis. Though there has been considerable progress in the study of intercellular interactions and intracellular features affecting cell form, it is still not known which molecular mechanisms are the main determinants of tissue morphogenesis. A theory of biological form should be based on physical-chemical parameters which are interpretable by molecular mechanisms, but at the same time permit derivation of evagination and form of multicellular tissues. This paper is an attempt to provide a framework for such a physical theory.

3511. Some algorithms for the computation of independent cluster solutions - Hofmann R.J. - Miami Univ., Miami, Fla. USA - PERCEPT. MOT. SKILLS 1977 45/3 II (1135-1142)

The Harris and Kaiser algorithm for computing independent cluster solutions is discussed and an alternative algorithm is presented. Both algorithms are presented within the context of a general algebraic framework for ideal orthogonal and oblique independent cluster solutions. Finally an example is presented whereby the alternative algorithm defines a better approximation to an ideal independent cluster solution than does Harris and Kaiser's algorithm.

3512. Human problem solving performance in a fault diagnosis task - Rouse W.B. - Dept. Med. Indust. Engin., Coordinat. Sci. Lab., Univ. Illinois, Urbana, Ill. 61801 USA - IEEE TRANS. SYST. MAN CYBERN. 1978 8/4 (258-271)

It is proposed that humans in automated systems will be asked to assume the role of troubleshooter or problem solver and that the problems which they will be asked to solve in such systems will not be amenable to rote solution. The design of visual displays for problem solving in such situations is considered, and the results of two experimental investigations of human problem solving performances in the diagnosis of faults in graphically displayed network problems are discussed. The effects of problem size, forced pacing, computer aiding, and training are considered. Results indicate that human performance deviates from optimality as problem size increases. Forced pacing appears to cause the human to adopt fairly brute force strategies, as compared to those adopted in self paced situations. Computer aiding substantially lessens the number of mistaken diagnoses by performing the bookkeeping portions of the task.

3513. On the reciprocal of a Fourier series - Guida A. - RCA Lab., Princeton, N.J. 08540 USA - PROC. IEEE 1978 66/3 (358-359)

The inverse or reciprocal of a complex periodic time function (expressed as a complex Fourier series) is another complex Fourier series. An algorithm for finding this inverse Fourier series is presented.

3514. New algorithms for digital convolution - Agarwal R.C. and Cooley J.W. - IBM Thomas J. Watson Res. Cent., Yorktown Heights, N.Y. 10598 USA - IEEE TRANS. ACOUST. SPEECH SIGN. PROC. 1977 25/5 (392-410)

It is shown how the Chinese Remainder Theorem (CRT) can be used to convert a one-dimensional cyclic convolution to a multidimensional convolution which is cyclic in all dimensions. Then, special algorithms are developed which compute the relatively short convolutions in each of the dimensions. The original suggestion for this procedure was made in order to extend the lengths of the convolutions which one can compute with number-theoretic transforms. However, it is shown that the method can be more efficient, for some data sequence lengths, than the fast Fourier transform (FFT) algorithm. Some of the short convolutions are computed by methods in an earlier paper by Agarwal and Burrus. Recent work of Winograd, consisting of theorems giving the minimum possible numbers of multiplications and methods for achieving them, are applied to these short convolutions.

2.2. Mechanical systems

3515. Vision during angular oscillation: the dynamic interaction of visual and vestibular mechanisms - Benson A.J. and Barnes G.R. - Roy. Air Force Inst. Aviat. Med., Farnborough GBR - AVIAT. SPACE ENVIRON. MED. 1978 49/111 (340-345)

A review is presented of the dynamic behaviour of two oculomotor control systems - the vestibulo-ocular and pursuit reflexes - responsible for the spatial and temporal stabilization of the image of an observed object on the fovea of the retina, and mathematical models adduced in which the contribution of physiological components of the systems can be identified. With angular oscillation of the head below 1-2 Hz, retinal information is used to maintain unity gain of the head/eye system, but at higher frequencies stabilization is determined primarily by vestibular inputs. When the observed target moves with the head, as in a head-mounted display, the suppression of inappropriate vestibulo-ocular responses is dependent upon the dynamic performance of the pursuit system. With such a display, impairment of visual acuity may be detected at frequencies of oscillation as low as 0.5 Hz.

3516. Mechanical energy states during running - Luhtanen P. and Komi P.V. - Kinesiology Lab., Dept. Biol. Phys. Activ., Univ. Jyväskylä FIN - EUR. J. APPL. PHYSIOL. OCCUP. PHYSIOL. 1978 38/1 (41-48)

Changes in total mechanical work and its

partitioning into different energy states (kinetic, potential and rotational) during a step cycle of running were investigated on six well trained athletes who ran at the test speeds of 40, 60, 80 and 100% (9.3 ± 0.3 m/s) of maximum. Cinematographic techniques were utilized to calculate the mechanical energy states as described by Norman et al. (1976), using a 13 segment mechanical model of a runner as the basis for the computations. The data showed that both the kinetic and rotational energy increased parabolically but the potential energy decreased linearly with increases in running velocity. The calculated power of the positive work phase increased quadratically with running speed. During the phase when the runner was in contact with the ground, the applied calculations gave similar increases for the positive and negative works, and the power ratio (W_{neg}/W_{pos}) stayed the same at all measured speeds. Therefore, it is likely that the method used to calculate the various mechanical energy states did not reflect accurately enough the physiological energy costs at higher running speeds. It may, however, be quite acceptable for estimating the mechanical energy states during walking and slow running, in which case the role of negative work is less and consequently the storage and utilization of elastic energy is small.

3517. The effect of varus stress on the moving rabbit knee joint - Ogata K., Whiteside L.A., Lesker P.A. and Simmons D.J. - Div. Orthop. Surg., Dept. Surg., Washington Univ. Sch. Med., St Louis, Mo. 63110 USA - CLIN. ORTHOP. RELAT. RES. 1977 No. 129 (313-318)

Unicompartmental osteoarthritis was produced by applying varus stress to moving rabbit knee joints. Degenerative changes were confined to the medial tibial and the medial femoral articular surfaces. Within the range of varus stress used, duration appears to be more important than magnitude of varus stress in determining the severity of cartilage damage. The calcified zone remained histologically unchanged despite advanced changes in the noncalcified zone superficial to the tidemark. Intrachondral degenerative cysts were frequently found in the basilar layers of the noncalcified cartilage adjacent to the tidemark where shear stresses were likely to be highest and diffusible nutrients least available. Highly cellular cartilaginous tissue was noted in the subchondral marrow spaces in the specimens with advanced cartilage degeneration. These areas appeared to be continuous with the overlying degenerated cartilage through gaps in the calcified cartilage. Subchondral bone did not show remarkable trabecular thickening despite advanced degenerative changes in the articular cartilage.

3518. Impedance and admittance tympanometry. II. Mathematical approach - Van Camp K.J., Vanhuyse V.J., Creten W.L. and Vanpeperstraete P.M. - Phys. Lab., Rijksuniv. Cent., Antwerp BEL - AUDIOLOGY (BASEL) 1978 17/2 (108-119) - summ in FREN

The W-notching of susceptance, conductance and admittance tympanograms, as well as inverted-V shapes, found at high probe tone frequencies are explained, starting from realistic assumptions on the

shape of resistance and reactance tympanograms. Necessary conditions for obtaining the different types of tympanograms are given. The theory shows that no pathology is necessary to explain W-notching or inverted-V shapes at higher-frequency probe tones.

3519. Rheological study of human synovial fluid (Fren) - ETUDE RHEOLOGIQUE DU LIQUIDE SYNOVIAL D'ORIGINE HUMAINE - Bellet D., Boyer P., Bousquet A. and Roques C. - Groupe Rheol., Inst. Mecan. Fluides, 31071 Toulouse Cedex FRA - J. FR. BIOPHYS. MED. NUCL. 1978 2/1 (69-73) - summ in ENGL

The mechanical part played in the organism by the synovial fluid is important, either in a healthy subject or in an unhealthy one. This study aims at the determination of rheological behaviour of this physiological fluid, the inference of biomechanical properties and, if possible, the correlation with pathological cases. The patients can be grouped in two categories: osteoarthritis is a mechanical condition; arthritis is an inflammatory one. The measurements have been made with a thermostated cone-plate rheometer. This rheometer is provided with an X-Y autoplottter giving the shear-stress/rate-of-strain curves (called here the rheograms). In any studied case a power law model taking part in the fluid constants, n (comportment index) and K (consistency) has been suggested. The investigation of the rheograms has been made by a numerical method. The first experiments are based on samples given from fifteen patients; whatever the source of the fluid we notice that the fluid has an inelastic pseudoplastic oswaldian behaviour. The first family of considered parameters relative to the patient on whom the fluid is sampled: age, sex and pathological condition especially. The other family of parameters is relative to the experimental conditions: time of conservation of the sample, attendance of heparin in the tube or its absence... After having remarked on the weakness of the incidences that the second family can produce we decided to present the conclusions relative to the first one in direct relation with the diagnosed disease.

3520. On the nonlinear viscoelastic behavior of soft biological tissues - Dehoff P.H. - Div. Interdisciplin. Studies, Clemson Univ., Clemson, S.C. 29631 USA - J. BIOMECH. 1978 11/1-2 (35-40)

Two approximate constitutive equations which have proved useful for characterizing the nonlinear viscoelastic behavior of polymers are proposed as candidate theories to characterize soft biological tissues. The equivalence of these theories with one form of the Fung equation for stress relaxation is demonstrated. It is shown that different results are predicted for constant strain rate tests for data presented by Haut and Little (1972) for collagen fibers.

3521. A mathematical model of intestinal motor activity - Bertuzzi A., Mancinelli R., Ronzoni G. and Salinari S. - Cent. Studio Sist. Controllo Calcolo Automat., CNR, 18-00184 Rome ITA - J. BIOMECH. 1978 11/1-2 (41-47)

A mathematical model describing the dynamics of

the intestinal wall and accounting for its large deformations is presented. The model makes reference to an isolated gut segment in a preparation well known in experimental physiology. A simplified representation of the functional characteristics of the smooth muscle and of the contraction process was used at the present stage. This model should help to analyse the mechanisms controlling the contraction of the intestinal wall and to evaluate diagnostic and therapeutic procedures for cases of motility disorders.

3522. Analytical solution to isometric mechanogram of Hill's model of striated muscle - Vit K. - Dept. Electr. Engin., Univ. Salford, Salford M5 4WT GBR - BULL. MATH. BIOL. 1978 40/3 (359-368)

The two-element muscle model considered consists of a contractile element defined by a hyperbolic force-velocity relation connected in series with an 'exponential spring'. Differential equations for the isometrically developed force during a tetanic contraction and the corresponding contractile element shortening velocity are derived and their stability is investigated. Analytical solutions to both equations are obtained. Two numerical examples are given, the second chosen to illustrate pressure-induced hypertrophy of a cardiac muscle.

3523. Simulation of human arm movements controlled by peripheral feedback - Van Dijk J.H.M. - Dept. Med. Physiol. Phys., Univ. Utrecht NLD - BIOL. CYBERN. 1978 29/3 (175-186)

A model of human arm, suitable for simulation purposes, is presented in order to investigate whether it is possible that peripheral feedback can play an important role during fast arm movements. In spite of factors such as the inertia of the system, the slow regulation of muscle tension, and efferent and afferent conduction delays between the muscles and the motoneuronal pools, it appears from the simulations that peripheral feedback of proprioceptive information could indeed be effective even during fast movements.

2.3. Heat and thermodynamics

3524. Simple probe for localized cryogenic blockade in the brain - Kwan H.C., Mackay W.A., Murphy J.T. and Wong Y.C. - Dept. Physiol., Med. Sci. Bldg, Univ. Toronto, Ontario CAN - PHYSIOL. BEHAV. 1977 19/3 (429-431)

The construction of a simple probe utilizing an air-space thermal insulation and circulating coolant for localized cooling of brain tissue is described. Results of isotherm studies in the cerebellum and electrophysiological observations in the motor cortex are presented indicating the effectiveness of localized cooling by the probe.

3525. Thermometry considerations in localized hyperthermia - Cetas T.C. and Connor W.G. - Div. Radiat. Oncol., Coll. Med., Univ. Arizona, Tucson, Ariz. USA - MED. PHYS. 1978 5/2 (79-91)

The introduction of local hyperthermia as a method of cancer therapy implies the necessity of quantitative measurements of the thermal dose. The authors'

intention is to describe the nature of the problem, both physically and physiologically, with illustrations drawn from thermographic measurements in phantoms and in animals. The characteristics of a thermometry calibration facility are described. Some measurement problems associated with conventional thermometer probes are mentioned and several new thermometers which were developed for use in the electromagnetic fields are reviewed. We present some of the concepts that will guide the development of noninvasive thermometry. Systemic hyperthermia is not considered. They recommend that other reviews specifically directed toward localized hyperthermia be prepared on the methods of heating and on thermal physiological problems.

3526. Mechanochemical contractile system as a thermodynamic machine - Antonets V.A. and Klochov B.N. - Radiophys. Res. Inst., Gorky SUN - BIOPHYSICS 1977 22/1 (68-72)

The mechanochemical contractile system, an example of which is cross-striated muscle, is regarded as a thermodynamic machine. For the steady state of contraction and on the basis of the thermodynamic approach expressions have been obtained for the coefficient of the efficiency of the contractile system and a comparison made with the known experiments.

2.4. Bioacoustics

3527. Decibel notation with correlated and uncorrelated signals - Punch J.L. and Lawrence W.F. - Dept. Hearing Speech Sci., Univ. Maryland, College Park, Md. 20742 USA - J. AM. AUDIOL. SOC. 1977 3/2 (71-79)

Audiologists perform level measurements in a variety of settings. These measurements typically involve clinical audiometric calibration, specification of sound field levels in industrial environments, psychoacoustic experimentation, or specification of sound levels in hearing aid test boxes or anechoic chambers. Any of these circumstances can present problem situations in which some form of signal combination is involved. Solutions of such problems require use of the concepts of average power and signal correlation, as they are related to decibel notation. These concepts are discussed in the present paper, and several examples that apply these concepts to specific measurement situations are presented.

3528. Frequency specific information retrieved from compound action potentials - model investigations and clinical results (Germ) - FREQUENZSPEZIFISCHE INFORMATION UND SUMMENAKTIONPOTENTIALE. MODELLUNTERSUCHUNGEN UND KLINISCHE RESULTATE - Hoke M. - HNO-Klin., Westf. Wilhelms-Univ., Munster i.W. GFR - LARYNGOL. RHINOL. OTOL. IHRE GRENZGEB. 1978 57/5 (452-463) - summ in ENGL

It is the aim of electrocochleographic assessments to determine with sufficient accuracy the hearing threshold in the frequency range usually covered by subjective audiometric investigations. An optimal

result would be an 'objective' audiogram comparable to the subjective one. In the present paper, difficulties and limits which are arising during the retrieval of frequency specific information from compound action potentials are demonstrated on the basis of model experiments. In connection with these experiments a new approach is demonstrated which is based on the reverse process of the physiological formation of the compound action potential. As a result of this method, the excitation pattern at the level of primary auditory neurons is obtained. The efficiency of this technique is shown by means of model simulations as well as by processing derived action potentials recorded from normal hearing subjects.

3529. Dependence of loudness growth on skirts of excitation patterns - Hellman R.P. - Dept. Speech Pathol. Audiol., Boston Univ., Boston, Mass. 02215 USA - J. ACOUST. SOC. AM. 1978 63/4 (1114-1119)

Over a range of 50 dB, the loudness of a 100-Hz tone was measured in the presence of a broadband noise with a low-frequency cutoff at 200 Hz. The noise was varied in intensity along with the tone so that the signal-to-noise ratio remained constant at either 0 or -10 dB. Listeners judged the loudness of the tone by loudness matching, magnitude estimation, and magnitude production. The noise markedly decreased the tone's rate of loudness growth but not the range over which loudness grows. The overall decrease in steepness of the 100-Hz loudness function was greater than that previously reported at higher frequencies. It is hypothesized that the decrease was greater because the spread of excitation at 100 Hz was more effectively contained than at higher frequencies. Support for this hypothesis is given by measures of intensity discrimination at 100 Hz.

3530. Model of the system of frequency stabilization of the echo signal of the locator of the horseshoe bat - Livshits M.S. and Pokotilo G.P. - Lobachevskii State Univ., Gorki SUN - BIOPHYSICS 1977 22/1 (135-140)

The anatomical, physiological and behavioral data relating to the work of the echo locator of the horseshoe bat are considered and also the results of the spectral analysis of its probing pulse. On the basis of physical analysis of these experimental findings the work of the sound emitting apparatus of the horseshoe bat is depicted and a phenomenological model of its system of frequency stabilization of the signal reflected from the chosen object is proposed. The model uses the differential method and therefore it ensures the attainment of the potential accuracy of frequency tuning and the independence of this tuning from a number of interfering factors, which agrees with the experiment.

3531. Investigation of the structure of the spectrum of communication signals of dolphins - Saprykin V.A., Vereshchagin V.I., Dokukin A.Ye. et al. SUN - BIOPHYSICS 1977 22/1 (152-156)

The paper investigates the dynamics of change in the fine structure of the spectrum of communication signals of dolphins using a Fourier algorithm of rapid

transformation. Analysis of the whistle signals with a computer yields quantitative evaluations of the spectral characteristics and shows that the coding of the information in the communication signals of dolphins may be brought about through the control of the power of the harmonics of the signal and the multiplicative modulation of the frequencies of the fundamental tone and the harmonics.

3532. Localization of sound producing animals using the arrival time differences of their signals at an array of microphones - Magyar I., Schleidt W.M. and Miller B. - Dept. Zool., Univ. Maryland, College Park, Md. 20742 USA - EXPERIENTIA 1978 34/5 (676-677)

This method provides a reliable means to determine distance between vocalizing individuals and their locations through a prolonged period of time without disturbance to the communication process by the presence of an observer. The accuracy of this method was tested by varying the arrival time differences on the microphone grid for known locations in a random fashion. This test shows that a vocalizing animal within an area of 4 ha surrounding the microphone array can be localized with an accuracy of ± 1 m. The accuracy decreases with the distance from the central area and as a function of the geometry of the array. The location of an individual can be determined based on 5 vocalizations given in sequence.

3533. Evaluation of an adaptive comb filtering method for enhancing speech degraded by white noise addition - Lim J.S., Oppenheim A.V. and Braidia L.D. - Dept. Electr. Engin. Co. Sci., Res. Lab. Electron., Massachusetts Inst. Technol., Cambridge, Mass. 02139 USA - IEEE TRANS. ACOUST. SPEECH SIGN. PROC. 1978 26/4 (354-358)

An intelligibility test was performed to evaluate an adaptive comb filtering method proposed by Frazier for enhancement of degraded speech due to additive white noise. Results indicate that independent of S/N ratio the adaptive comb filtering scheme does not increase speech intelligibility.

2.5. Biooptics

3534. On perceptual analyzers underlying visual texture discrimination: Part I - Caelli T. and Julesz B. - Bell Lab., Murray Hill, N.J. USA - BIOL. CYBERN. 1978 28/3 (167-175)

A class of feature detectors is found based on the quasi collinearity of dots, which result in visual texture discrimination even when second order statistics are equal. This degenerate counterexample to the Julesz conjecture on effortless texture discrimination has supplied the key to a simple theory of texture discrimination. Accordingly, effortless texture discrimination is based on two classes of perceptual detectors: Class A, those that measure differences in second-order (dipole) statistics; Class B, those that can still detect statistical differences in some features when second-order statistics are kept identical; for instance, the quasi-collinearity of adjacent dipoles. The difference thresholds (tuning curves) for the perceptual dipole and quasi-collinearity detectors have been

determined. These texture pairs were generated by a method that creates micropatterns with iso-dipole duals from 4 disks. The extension of this 4-disk method to 5 and more disks with iso-dipole duals permits the search for other kinds of perceptual detectors.

3535. An analysis of rod outer segment adaptation based on a simple equivalent circuit - Hemila S. - Dept. Zool., Univ. Helsinki FIN - BIOPHYS. STRUCT. MECH. 1978 4/2 (115-128)

This model of rod outer segment adaptation is based on the hypothesis that transmitter substance released by bleached rhodopsin closes sodium channels in the outer segment plasma membrane, leading to hyperpolarization of the receptor. The outer segment adaptation processes of the model are associated with the transmitter release, the transmitter background concentration and the plasma membrane leakage. Changes in the three model parameters correspond to the three types of outer segment adaptation processes. According to the model the stimulus-response function is in every adaptational state $U/U(\max)$ equals $1/(1+I(H))$. The model predicts how each adaptation process affects $I(H)$ and $U(\max)$. Specifically, when the number of liberated transmitter molecules per isomerizing quantum decreases, the amplitude $U(\max)$ remains constant but $I(H)$ increases. A short description of this model has been published in a paper reporting experimental results on background adaptation (Hemila, 1977).

3536. Neuronal model for stereoscopic vision - Trehub A. - Psychol. Res. Lab., VA Hosp., Northampton, Mass. 01060 USA - J. THEOR. BIOL. 1978 71/4 (479-486)

A neuronal model for stereopsis is described and simulated. Without the assumption of specific feature detectors, objects are unambiguously located in three-dimensional visual space. Random-dot stereograms are correctly resolved in depth with stimulus details conserved within planar contours.

3537. Information capacity of eyes - Snyder A.W., Laughlin S.B. and Stavenga D.G. - Inst. Adv. Stud., Dept. Appl. Mathemat., Australian Nat. Univ., Canberra AUS - VISION RES. 1977 17/10 (1163-1175)

The capacity of an eye to perceive the visual environment is quantified by determining the number of different pictures that can be reconstructed by its array of photoreceptors. There is an optimum density of photoreceptors for each mean luminance and contrast. This is determined by the wave and particle nature of light (diffraction and photon noise). Anatomical and psychophysical data are consistent with the hypothesis that the human retina maximizes the reconstruction of different pictures over the range in luminance required for day and night vision.

3538. Work of the human visual system. VI. Opposite colour difference and anti-colour. Third series of experiments - Yarbus A.L. - Inst. Probl. Informat. Transmiss., Moscow SUN - BIOPHYSICS 1977 22/1 (125-129)

The analysis of the opposite colour differences is continued. It is shown that the distortions of the colour differences and differences opposite to them appearing with change in the sensitivity of the receptors are opposite to each other and in certain conditions lead to the appearance of negative and positive sequential images.

3539. Pupil diameter and the depth-of-field of the human eye as measured by laser speckle - Charman W.N. and Whitefoot H. - Dept. Ophth. Opt., Univ. Manchester Inst. Sci. Technol., Manchester M60 1QD GBR - OPT. ACTA 1977 24/12 (1211-1216)

Results are given for the variation in the depth-of-field with entrance pupil diameter for 6 subjects. The method was based on observation of a laser speckle pattern at 633 nm on the surface of a slowly rotating drum. Depth-of-field falls with pupil diameters up to ~5 mm and then remains at an approximately constant value. The role of diffraction, the Stiles-Crawford effect and of non-optical aspects of the visual system are discussed.

2.7. Fluid flow systems

3540. Analysis of the frequency response of isolated arteries by means of a finite deformation elastic model - Thiry P.S. - Programme Genie Biomed., Ec. Polytechn., Univ. Montreal CAN - J. BIOENG. 1977 1/4 (455-463)

Finite deformation models have been used successfully to describe the in vitro static elastic properties of mammalian arteries. Besides, a theory is available for the description of finite amplitude radial oscillations of infinite elastic cylinders. In the present work, this latter theory is generalized by the introduction of the longitudinal extension ratio of the cylinder as a parameter. The variation pattern of resonance frequencies obtained for a class of materials with a constitutive equation of the exponential type is correlated with published results of vibration experiments on excised arteries.

3541. The interaction between transmural fluid exchange and blood viscosity in narrow blood vessels - Papenfuss H.D. and Gross J.F. - Dept. Chem. Engin., Univ. Arizona Tucson, Ariz. USA - BIORHEOLOGY 1977 14/5-6 (217-228)

This work is a theoretical study of the viscosity changes due to transmural fluid exchange in permeable blood vessels and their influence on the filtration rate. Two effects are considered: variation of the tube hematocrit along the vessel axis which leads to a concomitant variation of the suspension viscosity; and, variation of the total plasma protein concentration along the capillary axis which changes the plasma viscosity. For the first effect, experimental data of Barbee and Cokelet for tube diameters of 29-221 μm are used for the theoretical model. For capillaries of smaller diameters, the 'stacked-coins model' is used to simulate the single-file flow of the red cells. A fictitious reservoir approach is proposed to determine the Fahraeus and Fahraeus-Lindqvist effects for permeable blood vessels. Results for the rat glomerulus

show that the blood viscosity increases along the capillaries due to filtration by as much as 60%. However, this fluid mechanical change affects the filtration fraction by less than 2%, compared with results for earlier models which use the assumption of constant blood viscosity.

3542. Blood flow in intestinal absorption models - Winne D. - Abt. Molekularpharmakol., Pharmakol. Inst., Univ. Tübingen GFR - J. PHARMACOKINET. BIOPHARM. 1978 6/1 (55-78)

Up to the present, 10 models have been proposed or applied to analyze the relationship between blood flow and intestinal absorption. The conceptions of these models and their basic and final equations are described. In addition, their relationship to the first-order rate constants used in the models not explicitly including the blood flow rate is elucidated. Usually a curvilinear (concave curvature) relationship between the blood flow rate and the absorption rate is predicted by the models. This similarity of the curves is the reason that in many cases several models are compatible with the experimental data.

3543. Transfer function modelling of arteries - Brown J.M., Nahorski Z.T., Woodcock J.P. and Morris S.J. - Dept. Med. Phys., Bristol Gen Hosp., Bristol GBR - MED. BIOL. ENG. COMPUT. 1978 16/2 (161-164) - summ in FREN, GERM

The paper describes a method for processing input/output blood velocity waveforms for femoral arteries obtained from ultrasonic Doppler flowmeters. Normal, diseased and early cases of disease are discussed, and it is shown that a pictorial display of the roots of a quadratic equation provide a simple quantitative assessment of progress and treatment of disease.

3544. Note on the oscillations of collapsible tubes - Conrad W.A., Cohen M.L. and McQueen D.M. - Med. Engin. Lab., Stevens Inst., Tech., Hoboken, N.J. 07030 USA - MED. BIOL. ENG. COMPUT. 1978 16/2 (211-214) - summ in FREN, GERM

Evidence that the conditions downstream of an elastic constriction can strongly influence the frequency and existence of oscillations in collapsible tubes is presented. A lumped negative resistance model is used to describe oscillations in collapsible tubes. An extension of the existing theory is presented which takes into account the influence of distributed loads on the collapsible tube.

3545. Transient behaviour of the single loop solute cycling model of the renal medulla - Garner J.B., Crump K.S. and Stephenson J.L. - Dept. Mathemat., Louisiana Tech Univ., Ruston, La. 71272 USA - BULL. MATH. BIOL. 1978 40/3 (273-300)

Transient solutions are developed for the buildup of a concentration gradient in the single loop solute cycling model of the renal medulla. The 'pump' from ascending limb to descending limb is considered in both unsaturated and completely saturated modes of operation. Both analytic solutions and semianalytic solutions obtained from inverting Laplace transforms

are considered. The classic representation of concentration buildup by the multiplication process is compared with calculated profiles. The 'single effect' is found to vary both in time and space.

2.8. Electrical systems

3546. An exact solution to a problem of nonlinear electrotonus - Pickard W.F. - Dept. Electr. Engin., Washington Univ., Saint Louis, Mo. 63130 USA - MATH.BIOSCI. 1977 33/1-2 (1-4)

An exact solution is presented for the problem of electrotonus along a dendrite whose passive membrane currents are governed by infile permeation mechanisms. It is shown that, within 100 mV of the resting potential, electrotonus will not differ appreciably from that predicted by a linear approximation.

3547. Properties of lipid bilayer membranes made from lipids containing phytanic acid - Janko K. and Benz R. - Fachber. Biol., Univ. Constance GFR - BIOCHIM. BIOPHYS. ACTA 1977 470/1 (8-16)

Besides the preparation of phytanic acid (3,7,11,15-tetramethylhexadecylic acid) according to the Dumas-Stass reaction, the synthesis of four different lipids containing phytanic acid residues is described. Diphytanoyl phosphatidylcholine was synthesized beginning from glycerylphosphorylcholine, whereas the other lipids, diphytanoyl phosphatidylethanolamine, diphytanoyl phosphatidylserine and monophytanoyl glyceride were prepared by total synthesis. Some properties of lipid bilayer membranes made from the lipids containing phytanic acid were investigated. The specific capacity of these membranes was measured. Its value of approximately 400 nF cm^{-2} was found to be similar to the value of membranes from lipids with unbranched fatty acid residues. Charge pulse experiments were performed using dipicrylamine as a molecular probe of membrane structure. The results were discussed on the basis of a higher viscosity of the membranes from lipids containing phytanic acid residues compared with unbranched fatty acid residues.

3548. Experiments with a model for a neuron population - Zettergerg L.H. SWE - ELECTROENCEPHALOGR. CLIN. NEUROPHYSIOL. 1977 43/4 (No. E 118)

A population containing two or three types of interconnected neurons is considered. It may be the thalamocortical relay cells, interneurons and intermediate neurons or it may be cortical pyramidal cells and its interneurons. The model is made up of function blocks one for each group of neurons. Each block contains a nonlinear function and linear filters, the latter representing the action of excitatory and inhibitory post synaptic potentials but they may also take into account synaptic and transmission delays. These function blocks are interconnected to the main group of neurons. Analogue equipment has been built to implement the model and certain experiments have been carried out. The network may be stable or unstable depending upon the coupling coefficients of

the feedback loops and the dc levels of the input signal. As input signals the authors use either a sinusoidal, noise signal or a combination thereof. In this way the authors can mimic the interconnection of several neuron populations. The network will produce an output that resembles background EEG activity when driven with noise of low level. With the network parameters appropriately adjusted occasional instabilities may occur and the corresponding signals resemble epileptic spikes in background EEG activity. With an added sinusoidal the authors are able to simulate signals that occur under certain other epileptic conditions. Results indicate that epileptic signals will be produced in a neuron population when the interconnections and stimulation are such that the system becomes unstable.

3549. Analysis of the multi-pore system of alamethicin in a lipid membrane. II. Autocorrelation analysis and power spectral density - Kolb H.A. and Boheim G. - Fachber. Biol., Univ. Konstanz GFR - J. MEMBR. BIOL. 1978 38/1-2 (151-191)

The properties of the alamethicin pore in multi-pore systems have been studied by autocorrelation analysis and by power spectral density. In agreement with the relaxation studies of part I, the authors found two processes of different time behavior and voltage dependency. The slow (sec) and fast (msec) correlation times could be related to fluctuations in the number of pores and to transitions between different levels of conductance within a pore, respectively. The interpretation of the correlation amplitudes in terms of a simplified three-state model used for the calculation of the corresponding unit step conductances confirms the assignment. The correlation amplitude of the slow process could be related to the mean single-pore conductance. The mean conductance difference of neighboring conducting pore states could be estimated using the product of the correlation amplitudes of the slow and fast process. In the range of weakly voltage-dependent conductance a strongly conductance-dependent increase of the correlation times as well as of the correlation amplitudes was observed. A conductance dependent on the size of the preaggregate from which the pore is formed was proposed for an interpretation of these findings. The mean single-pore conductance and the mean conductance difference of neighboring conducting pore states vary approximately linearly (on the log/log scale) on ion concentration in the range 0.1 to 1 M KCl. The salt concentration dependence of the macroscopic conductance was found to increase with decreasing temperature. An influence of the ionic strength on both correlation times could be observed.

3550. Activation, inactivation, and chemical blockage of the gating current in squid giant axons - Meves H. - Lab. Mar. Biol. Ass., Plymouth GBR - ANN. N.Y. ACAD. SCI. 1977 Vol.303 (322-338)

The object of this article is to summarize what is known about the presumed connection between intramembrane charge movement and changes in Na permeability. Most people agree now that the connection is complicated and that the precise relation

between intramembrane charge movement and permeability change has not yet been established.

3551. Experimental comparison of four inverse electrocardiographic constructs in the isolated rabbit heart - Mirvis D.M., Keller F.W. and Cox J.W. - Sect. Med. Phys., Dept. Med., Univ. Tennessee Cent. Hlth Sci., Memphis, Tenn. USA - J. ELECTROCARDIOL. 1978 11/1 (57-65)

Complex models of the heart's electrical activity have been proposed as being superior to the fixed-location-dipole equivalent cardiac generator. To test and to compare the adequacy of four such proposals, i.e., a four element centric multipole series (CMS), a single moving dipole (SMD), two moving dipoles (TMD), and a moving dipole-quadrupole pair (DPQP), the electrical fields generated by thirty isolated, perfused rabbit hearts placed in a spherical volume conductor were studied. Waveforms recorded from 32 surface electrodes were sampled 2500 times per second per channel, and generator parameters were computed using previously reported methods. A CMS accounted for $99.5 \pm 0.21\%$ (mean $\pm$ S.E.M.) of sum-squared surface potential recorded during ventricular depolarization. The dipole, quadrupole, octapole, and hexadecapole terms fit 3.3 to 98.2%, 7.2 to 70.8%, 0.2 to 29.9% and 0.02 to 12.7% of observed potential, respectively. A SMD fit $90.9 \pm 0.25\%$ of surface activity, whereas the TMD and DPQP constructs accounted for $98.4 \pm 0.21\%$ and $99.2 \pm 0.21\%$ of surface potential, respectively. The CMS accounted for significantly more ($p < 0.01$) surface potential than did a centric dipole or a SMD throughout the QRS. In contrast, the TMD and the DPQP models provided as good a fit of recorded potential as did the CMS during much of depolarization. The potential ability of the TMD and DPQP constructs to localize as well as to characterize the cardiac sources suggests an important role for these models in inverse electrocardiography.

3552. Molecular model for sodium conductance and calcium transport in the squid axon - Siep E. - Inst. Biol. III, Univ. Freiburg/Br. GFR - J. MATH. BIOL. 1978 5/2 (143-168)

A molecular and biochemically plausible model for the excitation process of the sodium pore is suggested. From basic arguments it is concluded that the sodium pore exists in at least three states: the resting state, the sodium conducting state, and the refractory state. They are connected to form a cyclic process. A specification of the different states is given. It is suggested that inactivation of the sodium pore results from a conformational change, which is caused by the transport of a calcium ion through the membrane. The transport carrier is the sodium pore. This assumption can explain the observed calcium influx during stimulation, and the effect of Ca on the rate of inactivation and on the rate at which sodium conductance shuts off upon repolarization. It cannot give a quantitative explanation for the effect of Ca on the rate of rise, peak sodium conductance, and steady state inactivation. These aspects are successfully described by the surface potential hypothesis, which has been published recently. It is concluded that a

combination of both theories gives a rather complete description of the sodium pore. The Ca transport model is discussed quantitatively and in great detail.

3553. Prediction of limit cycles in mathematical models of biological oscillations - Glass L. and Pasternack J.S. - Dept. Physiol., McGill Univ., Montreal, Quebec CAN - BULL. MATH. BIOL. 1978 40/1 (27-44)

Three conjectures are given which predict the existence of unique stable limit cycle oscillations in a class of piecewise linear differential equations. The equations are appropriate to model biological or other complex systems in which there are switchlike interactions between the elements of the network. Methods are presented which can be used to develop mathematical models which are conjectured to display stable limit cycle oscillations, from qualitative experimental information about relative phases of activity in the dynamical systems. Several illustrative numerical examples are given, and one experimental example from neurobiology is discussed.

3554. The effects of calcium⁺⁺ on bursting neurons. A modeling study - Plant R.E. - Dept. Mathemat., Univ. California, Davis, Calif. 95616 USA - BIOPHYS. J. 1978 21/3 (217-237)

Many observed effects of ionized calcium on bursting pacemaker neurons may be accounted for by assuming that calcium has multiple effects on the membrane conductance mechanisms. Two models are proposed that represent extreme cases of a set of possible models for these multiple effects. Both models are a priori designed to account for directly observed phenomena, and both are found to be able to simulate a posteriori certain observed phenomena, including persistent inactivation, increasing spike width, and decreasing after-polarization. Experimental tests are proposed for the decision of validity between the set of model discussed and the null hypothesis, and for the decision of validity between the two models themselves. Extensions of the models are discussed. One of these extensions leads to a simulation of the behaviour of the cell when placed in a calcium-free bathing medium.

3555. Theoretical analysis of the forces responsible for interaction of the bilayer lipid membranes in the zone of contact - Yelkin A.P. - Inst. Biol. Phys., USSR, Acad. Sci., Pushchino SUN - BIOPHYSICS 1977 22/3 (456-460)

A theoretical analysis has been made of the forces responsible for the interaction of the b.l.m. in the zone of contact. It is shown that such forces are the forces of Van-der Waals attraction, electrostatic repulsion and the forces of the surface tension of the membranes. The values of the Hamaker constant and the surface potential of the b.l.m. are determined. The value and the distant action of each force and also the possibilities offered by the method of measuring the distance between the contacting membranes are discussed.

3556. Size of erythrocytes of human blood as revealed by specific electrical conductivity - Chelidze T.L.,

Yakovlev I.L., Kiknadze V.D. and Kevlishvili G.Ye. - Mukhadze Haematol. Blood Transf. Res. Inst., Tbilisi SUN - BIOPHYSICS 1977 22/3 (494-497)

The results of conductometry lead to the conclusion that the diameter of the erythrocytes calculated by Fricke's theory exceeds the visible diameter obtained by the method of optical microscopy by 0.25 μm . A similar excess is given by visometry and centrifugation. Such a discrepancy may be explained by the presence on the outer surface of the membrane of a 'residual non-conducting layer' transparent to visible light. In calculations of the conductivity of the membranes of erythrocytes by the method of dielectro-spectroscopy it is necessary to use values of the volumetric share calculated from the Maxwell formula.

3557. On statistical methods in neuronal spike-train analysis - Yang G.L. and Chen T.C. - Dept. Mathemat., Univ. Maryland, College Park, Md. 20742 USA - MATH. BIOSCI. 1978 38/1-2 (1-34)

Changes in membrane potential of a neuron are, under certain experimental conditions, manifested by spike discharges. The number of spikes recorded from the neuron within a given period represents the information which the neuron conveys; and the message, thus transmitted, is carried by the pattern of spikes and the intervals between spikes. This can be modeled by a stochastic point process. This article reviews in three parts recent developments of the statistical analysis of discharge patterns of spike trains recorded from individual nerve cells, and suggests several methods for identifying certain types of spike trains. The first part reviews those stochastic processes $Y(t)$ used as models for the membrane potential changes. The occurrence time of a spike is defined as a first-passage time of $Y(t)$ upcrossing a threshold value. These upcrossing times form a point process describing the occurrences of spikes. Evidently, the occurrence rate depends on the underlying assumption of $Y(t)$. Presently, a majority of the point process models adopt the renewal-process assumptions. The second part deals with statistical inferences on the models and the validation methods. The research in this area is scarce; the inference on renewal processes is based mostly on Cox and Lewis's book *The Statistical Analysis of Series of Events*. We have used the contiguity theory due to Le Cam [30] to derive several asymptotically optimal statistical procedures. The last part discusses some popular statistical techniques employed and some areas needed for further investigation.

3558. Plausible function of golgi cells in the cerebellar cortex - Nagano T. and Ohmi O. - Inform. Sci. Div., Electrotechn. Lab., Waseda Univ., Tokyo JPN - BIOL. CYBERN. 1978 29/2 (75-82)

The function of Golgi cells in the cerebellar cortex is quantitatively examined in consideration of the nonlinear input-output characteristics and convergence and divergence numbers of cells. It is strongly suggested that the two signal paths to Golgi cells have different function. The feed-forward path will have the same function as assumed in the previous theories of the cerebellar cortex, that is, to keep the firing rate of granule cells approximately constant over considerable

variation in the firing rate of mossy fibers. The feedback path will, on the other hand, have a new function which has not been assumed in the previous theories. The function is to cause oscillation of the firing rate of granule cells for stationary mossy fiber inputs. The assumption of the new function enables us to explain cerebellar function to keep stationary posture.

3559. Local existence of the nerve impulse - Feroe J.A. - Dept. Mathemat., Vassar Coll., Poughkeepsie, N.Y. 12601 USA - MATH. BIOSCI. 1978 38/3-4 (259-277)

The existence of an impulse solution to a general nerve axon equation is demonstrated in the neighborhood of an assumed sufficiently good approximate solution. This is done in a functional analytic setting by an iteration based on Newton's method which it is shown would converge to the solution (and its velocity). The Kantorovich theorem additionally provides bounds on the neighborhood.

3560. On the moments of the firing interval of the diffusion approximated model neuron - Sato S. - Dept. Biophys. Engin., Fac. Engin. Sci., Osaka Univ., Toyonaka, Osaka JPN - MATH. BIOSCI. 1978 39/1-2 (53-70)

The n th moments of the firing interval of the diffusion approximated model neuron with a constant threshold level were obtained for $n = 1, 2, 3$. The distribution function was also computed numerically, utilizing Durbin's method. Simple relations on the mean and the variance were obtained for the low and the high threshold level, respectively.

3561. The stochastic properties of the basic neuron populations as information processing system - Usami H., Masaki S. and Sato R. - Dept. Informat. Sci., Fac. Engin., Tohoku Univ., Sendai JPN - BIOL. CYBERN. 1978 29/3 (167-173)

This paper deals with the stochastic properties of the simplest neuron population consisting of 2 neurons. 2 modes of neural coupling are discussed. One is the forward inhibition mode [FI] and the other is the backward inhibition mode [BI]. In the forward inhibition mode, the two neurons are assumed to be independent of each other. In the backward inhibition mode, the two neurons interact, but the inputs to the neurons are assumed to be independent of each other. In the analysis, the authors first obtained the probability density function [p.d.f.] of the interspike intervals of the output impulse trains in FI and BI. Then the authors defined the mean rate transfer function from the mean rate of these p.d.f.'s. Finally, by comparing the analytical results with the physiological experimental data, it is clear that the difference in the stochastic properties can be accounted for by the difference in the coupling mode (i.e. FI or BI).

2.9. Nuclear biophysics

3562. Photon and electron response of silicon-diode neutron detectors - McCall R.C., Jenkins T.M. and Oliver G.D. Jr. - Stanford Linear Accelerator Cent.,

Stanford Univ., Stanford, Calif. 94305 USA - MED. PHYS. 1978 5/1 (37-41)

The photon response of silicon-diode neutron detectors is analyzed theoretically and measured in the 15-25-Me V region. The main mechanism for producing a response in the diode is shown to be the displacement of silicon atoms by scattering of electrons. If the photon source is an electron accelerator target, the response is mostly due to electrons originating in the target with a smaller contribution from electrons produced in the diode by photons generated at small angles to the beam.

3563. Behavior of p-n junction silicon radiation detectors in a temperature- compensated direct-current circuit - Klevenhagen S.C. - Dept. Med. Phys., (London Hosp., London GBR - MED. PHYS. 1978 5/1 (52-57)

The behavior of silicon p-n junction radiation detectors used in the direct-current short-circuit mode without bias was examined under such load resistance which ensures operation in a temperature-compensated state. The objective was twofold; to check whether the compensation is achieved and to investigate the extent of compensation shown at temperatures other than that initially selected as the operation point. It was found that the detector performance in various thermal conditions can be predicted from a knowledge of the behavior of the individual detector and circuit parameters and that it is possible to stabilize the detector response within $\pm 2\%$ over a relatively wide temperature range: $18^\circ - 40^\circ\text{C}$. However, in the case of devices which show thermal currents of large temperature sensitivity, compensation at small and at large dose rates needs to be considered separately.

3564. The proton microprobe: A powerful tool for nondestructive trace element analysis - Bosch F., El Goresy A., Martin B. et al. - Max-Planck-Inst. Kernphys., Heidelberg GFR - SCIENCE 1978 199/4330 (765-768)

A proton microprobe capable of focusing proton beams with energies up to 6 million electron volts to a spot size of 2×2 square micrometers has been used for chemical analysis of small grains of minerals in lunar samples by proton-induced x-ray emission. The proton microprobe is preferable to the electron microprobe for analyzing trace elements whose concentrations are below the detection limit of the latter and for analyzing objects with numerous major and trace elements with a wide range of atomic numbers. Application of the proton microprobe to biological samples is feasible.

3565. Candu reactor operation for electricity production and district heating - Rogers J.T., Abdelkerim A.E. and Swinton M.C. - Carleton Univ., Energy Res. Group, Ottawa, Ont. K1S 5B6 CAN - NUCL. TECHNOL. 1978 38/2 (165-173)

Taking advantage of the potential benefits of a combined electricity production and district heating nuclear power plant requires the integration of the plant into two grids: the electrical grid and the thermal grid. The integration of a CANDU reactor of the Pickering type into the grids has been assessed, and some preliminary conclusions have been reached. For a

given system size and fractional nuclear capacity, the practical optimum extraction point for steam from the turbines for the district heating system has been established. With steam from the practical optimum extraction point, there is considerable economic incentive to maximize the fractional nuclear capacity of the system. As a system grows, the unit thermal costs of heat at the plant boundary are reduced significantly by adding nuclear capacity. This conclusion suggests that advantage be taken of the characteristic flexibility of extraction-condensing turbines to accelerate the growth of the nuclear contribution to the system.

3566. An alternate method for MPC calculation using the absorbed dose data of mird pamphlet No. 11 - Yamaguchi C. - Nat. Lab. High Energy Phys., Ibaraki JPN - HEALTH PHYS. 1978 34/4 (371-374)

An alternate method for the calculation of the maximum permissible concentration, MPC, of radioactive nuclides is presented. The method is based on the absorbed dose per unit cumulated activity, S , tabulated in Pamphlet No. 11 of the Medical Internal Radiation Dose, MIRD, Committee of the (American) Society of Nuclear Medicine. The basic philosophy is based on the report of the Committee II of the International Commission of Radiation Protection, ICRP. The most significant feature of the present method is that it requires no evaluation of the effective energy, which was a most troublesome and laborious process for the MPC calculation.

3567. A charge collector to determine the stopping distribution of a pion beam - Shortt K.R. and Henkelman R.M. - Batho Biomed. Facility, TRIUMF, Univ. Brit. Columbia, Vancouver V6T 1W5 CAN - PHYS. MED. BIOL. 1978 23/3 (495-498)

It has been possible using a charge collector to measure the stopping distribution of negative pions even in the presence of a large electron contamination. It is anticipated that measurements made in a pion beam with low electron contamination would show a reduced background which would in turn improve the ability to localise the pion stars even where the stopping distribution is extended in depth. An electron knock on region at shallow depths has also been detected, although it is unlikely that this will correspond to any significant dose build-up since most of the entrance dose is directly deposited by the incident charged particles. It is anticipated that the ability to measure the stopping distribution in high intensity pion beams will provide another means of characterising the high LET component of the pion radiation field and thus be of predictive value for biological isoeffect.

3. GENERAL INSTRUMENTATION

3568. A portable, adjustable finger printing stand - Johnson R.P. and Richter O.F. - Child Developm. Lab., Univ. Illinois, Urbana, Ill. 61801 USA - AM. J. PHYS. ANTHROPOL. 1978 48/2 (255-256)

A lightweight finger printing stand is described which can be adjusted to the proper printing height.

Based upon experience printing over 1,100 subjects, 12 advantages of using the stand are suggested.

3569. Five years' experience in the rescue center in Ulm (Germ) - 5 JAHRE ERFAHRUNGEN AM RETTUNGSZENTRUM ULM - Gorgass B., Ahnefeld F.W. and Lippert H.D. - Bundeswehrkrankenhh., Ulm GFR - NOTFALL MED. 1978 4/4 (195-206)

Experience in the past five years at the emergency medical center in Ulm (GFR) and its present organisation is discussed.

3.1. Transducers

3570. A circumferentially-sensitive miniature pressure sensor for study of human esophageal motility - Kaye M.D., Showalter J.P., Rock K.C. and Johnson E. - Gastroenterol. Unit, Univ. Vermont, Burlington, Vt. USA - MED. RES. ENG. 1977 12/5 (10-15)

Manometric systems in current use for study of human esophageal motility consist of sensors with a restricted radial disposition. Since both upper and lower esophageal sphincters are asymmetrical structures, such sensors are not ideal for sphincteric pressure measurements. In this report, we describe a circumferentially sensitive sensor (MT) which consists essentially of a miniature transducer mounted within a sealed fluid-filled chamber, surrounded by a pressure-sensitive silastic diaphragm. This device is accurate and sensitive. It was compared in 10 young healthy men with a standard perfused catheter system (PC) composed of three catheters, whose side openings were at the same axial level, connected to external transducers. Pressures recorded from the lower esophageal sphincter were significantly higher with the MT than with the PC; and in the upper esophageal sphincter, the rapid pressure changes associated with deglutition were far more faithfully reproduced with the MT. Contractile pressures recorded after swallowing from the body of the esophagus were similar with the two systems, provided that catheters were perfused at a rapid rate (approximately 8 ml/min for each catheter). This preliminary evaluation indicates that this MT has significant advantages as compared with currently available systems.

3571. The design of efficient broad-band piezoelectric transducers - Desilets C.S., Fraser J.D. and Kino G.S. - Edward L. Ginzton Lab., W.W. Hansen Labs Phys., Stanford Univ., Stanford, Calif. 94305 USA - IEEE TRANS. SONICS ULTRASON. 1978 25/3 (115-125)

A design method for acoustic thin disk transducers with high efficiency, broad bandwidth, and good impulse response is presented. This method is based on the use of quarter-wave matching layers between the piezoelectric material and the acoustic load. As is made evident using the transmission line model of Krimholtz, Leedom, and Matthaei, the finite thickness of the piezoelectric material must be taken into account in the matching layer design. Criteria for optimum broad-band transducer designs with a given piezoelectric material are developed which show the importance of a high electromechanical coupling

coefficient. A method for obtaining Gaussian shaped pass-bands, necessary for optimum impulse response, is also shown. Several transducers have been built to illustrate this design approach with excellent agreement between theory and experiment. One such transducer has 3.2 dB round trip insertion loss and one octave bandwidth.

3572. A thick-film digital potentiometer - Wilkinson A.B. - Dept. Electr. Electron. Engin., Univ. Coll., Cardiff CF2 1TA GBR - INT. J. ELECTRON. 1978 45/1 (71-80)

This paper describes a digital potentiometer constructed using thick-film techniques and consisting of a 16-bit TTL shift register and 16 single pole-double throw FET switches connecting an inverted R-2R resistor network to an operational amplifier. The register and switches are formed from unencapsulated 'chips' mounted on a 2 in. X 1 in. ceramic substrate. The R-2R network is formed with thin-film and discrete resistors. Constructional details are given that illustrate the practicality of using a thick-film technique for composite analogue/digital circuitry.

3573. Anomalous gain changes in photomultiplier tubes for use in scintillation counting - Yamashita M. - Radioact. Sect., Electrotechn. Lab., Tokyo JPN - REV. SCI. INSTRUM. 1978 49/4 (499-502)

Abrupt pulse height changes and different steady state pulse heights exhibited at particular count rates are observed reproducibly in RCA 8850 and 8575 tubes. These phenomena are shown to be identical in nature with the hysteresis effect observed previously in a different type of tube. The implications for a standard count rate stability test and precision scintillation counting experiments are briefly discussed.

3.2. Amplifiers

3574. Statistical signal detection in correlated clutter using digital matched filters - Kajiji S.H., Rao B.V. and Rao V.P. - Dept. Electr. Engin., IIT, Bombay IND - INT. J. ELECTRON. 1978 44/6 (577-584)

The performances of a digital matched filter for a pseudo-random binary sequence has been studied and evaluated when the echo is contaminated by uncorrelated and correlated noise. Simple formulae have been derived to compute the degradation in false-alarm rate in terms of the correlation coefficient of clutter.

3575. Comments on 'A novel 'follow the master' filter' - Brand J.R. and Schaumann R. - Dept. Electr. Engin., Univ. Minnesota, Minneapolis, Minn. 55455 USA - PROC. IEEE 1978 66/5 (590-592)

The above work presents a technique for stabilizing the pole-frequency (ω_0) of active R filters which is essentially identical to one reported earlier, but in which different conclusions are obtained concerning the technique's merits. Amplifier excess phase will generally cause pole-Q deviations with temperature even if ω_0 is stabilized; therefore, most of the conclusions in the above letter are only approximately

correct for the special case of a low ωQ -product.

3576. Design of tunable multiple input RC notch filters - Mohan P.V.A. and Sen S. - Switching R&D, Indian Teleph. Industr., Ltd., Bangalore IND - PROC. IEEE 1978 66/3 (352-354)

The design of multiple input RC notch filters with tunable notch frequency, notch depth, and sharpness of the notch described.

3577. Generalization of active RC all pass schemes - Patranabis D., Roy S.B. and Tripathi M.P. - Dept. Electron. Telecommunic. Engin., Jadavpur Univ., Calcutta IND - PROC. IEEE 1978 66/3 (354-356)

A generalization scheme of the active RC all pass networks interconnecting one three terminal network with another four terminal one, constrained by a differential input operational amplifier, is presented. It is further shown that the scheme is, in fact, a completely general one for active filter realization.

3578. High-selectivity grounded capacitor bandpass/low-pass filters using the operational amplifier pole - Nandi R. - Dept. Electron. Telecommunicat. Engin., Jadavpur Univ., Calcutta IND - PROC. IEEE 1978 66/7 (798-800)

Using the single-pole model of the operational amplifier (OA), a grounded capacitor network has been analyzed to yield either a bandpass or a low-pass function by adjustment of a single resistor. The bandpass/low-pass filters are suitable for high selectivity applications at extended frequency ranges with the advantage of independent adjustment of pole-frequency, pole-Q factor, and midband/passband transmission gain. The network has low sensitivity to all circuit parameters. The experimental results are quite in agreement with the analysis.

3.3. Indicators

3579. A new way in the development of electronic electrometers with a varicap-diode modulator - Herscovici H. - Res. Lab. Process Contr. Instrumentat., Inst. Res. Design Automat., Bucharest ROM - IEEE TRANS. INSTRUM. MEAS. 1978 27/3 (276-280)

In this paper, the theoretical studies and adopted technical solutions relative to an electronic electrometer with a varicap-diode modulator are described. The electrometer has an input resistance of $10^{14} \Omega$ at 1-V input. The use of this electrometer technique and the performance limitations which may be obtained are analyzed. In order to overcome the usual input resistance of the varicap-diode modulator, reverse polarization of the bridge diodes is used. This provides an increase in input modulator resistance of about 15 times.

3.4. Recorders

3580. Automated spectrum analysis - Matheson R.J. - Inst. Telecommunic. Sci., Boulder, Colo. 80302 USA - PROC. IEEE 1978 66/4 (392-402)

Automatic spectrum analyzers (ASA's) combine a

powerful RF measurement system with computer control and data processing. This article discusses a typical ASA block diagram (analog and digital subsystems), shows how the calibration procedures used in such systems enhance the accuracy of measurements, and discusses some of the problems with current ASA systems. The present use of examples of ASA systems used in production testing of large electronic systems, measurements of the electromagnetic environment, communication satellite monitoring, and EMC testing. Finally, alternate technologies for making spectrum measurements and the future of ASA's are discussed.

3.5. Generators

3581. A uniformly distributed analog random voltage generator - Castan  F. - Inst. Nat. Polytechn., 31071 Toulouse Cedex FRA - PROC. IEEE 1978 66/5 (605-606)

Whereas random number generating methods are numerous, uniformly distributed analog random voltages are difficult to obtain directly. A method based upon the use of a point process is proposed, which leads to a practical noise generator with accurate uniform amplitude distribution, which is very easy to implement.

3.6. Telemetric devices

3582. Radio telemetry system for obtaining body temperature during simulated diving to 1000 FSW - Verlander J.M., Beerwinkle K. and Fife W.P. - Hyperbarics Lab., Dept. Biol., Texas A and M Univ., College Station, Tex. 77843 USA - AVIAT. SPACE ENVIRON. MED. 1978 49/4 (641-643)

An implantable radio telemetry system for transmitting deep body temperatures from dogs subjected to hyperbaric conditions was designed and tested. The design was adapted from a transmitter described, and was successfully tested both in vitro and in vivo to a simulated depth of 1000 FSW. Circuit schematic, printed circuit layout, and component layout are given.

3583. Snap harness for biotelemetry from rodents - Roman B. and Bennett E.L. - Lab. Chem. Biodynamics, Lawrence Berkeley Lab., Univ. California Berkeley, Calif. 94720 USA - PHYSIOL. BEHAV. 1978 20/3 (349-350)

A snap harness is described which incorporates a commercially built 5g FM transmitter (FM-110-E3) (Narco Bio-Systems, Inc., Houston, TX) for telemetering biopotentials in rats and other small rodents. The harness allows the stable recording of a variety of biopotentials from unanesthetized freely moving animals for experimental periods of a few weeks. There is the added advantage and flexibility of easily snapping the harness on and off during and after experimental periods, permitting recordings from a number of animals with the same transmitter.

3584. The elementary dipole and its reflection - Slaton T. GBR - MARCONI REV. 1978 41/209 (115-127)

Performance analysis for h.f. (and lower frequency) links requires a simple, but basic, understanding of the transmitting characteristics of short monopoles and dipoles. Power input to produce a datum field intensity, radiation resistance and transmission loss are tabulated for cases of interest assuming a perfectly reflecting surface for the earth. Some difficulties have occurred in defining antenna gain so that the gain figure may be applied validly both to the transmit and receive antennas, and linked to this problem is that of stating correctly the radiation resistance (or effective collecting area) of receiving antennas at ground level. The difficulty is caused by the effect of the ground-reflected signal; some guidance on the nature of the problem is presented. No attempt is made to deal with the basic theory.

3585. Oscillators with frequency and amplitude outputs for the measurement of two parameters - Owen E.W. - Dept. Electr. Engin., Univ. California, Davis, Calif. 95616 USA - IEEE TRANS. INSTRUM. MEAS. 1978 27/1 (11-15)

A class of harmonic oscillators is described which has the frequency of oscillation determined by one parameter of an RC or RL circuit and the amplitude of oscillation by the other parameter. These oscillators are useful in the impedance measurement of physical or biological objects when two attributes of the object are related to two electrical parameters of the equivalent circuit. A pole or zero is derived from the measured object by isolating it from the oscillator. The remainder of the oscillator contains linear elements and a single memoryless nonlinearity. Second-order oscillators containing a hard nonlinearity and third-order oscillators containing a soft nonlinearity are presented. The frequency and amplitude relationships are derived using linear theory and the describing function method. The theoretical results are verified by analog computer simulations. The oscillators are described in general terms by means of flow graphs.

3586. Microwave modelling of h.f. Yagi antennas over imperfectly-conducting ground - Hall P.S., Chambers B. and McInnes P.A. - Dept. Electron. Electr. Engin., Roy. Milit. Coll. Sci., Shrivenham, Swindon SN6 8LA GBR - PROC. INST. ELECTR. ENG. 1978 125/4 (261-266)

Yagi antennas operating at 25 MHz over real ground have been modelled at microwave frequencies. The method of modelling ground, the measurement of its electrical parameters and the apparatus for measuring radiation patterns of model antennas are described. Typical radiation patterns thus obtained are compared with those predicted from theory.

3.8. Cameras

3587. Simultaneous stereophotogrammetric and angiographic fundus camera - Matsui M., Parel J.M. and Norton E.W.D. - Dept. Ophthalmol., Nihon Univ. Sch. Med., Tokyo JPN - AM. J. OPHTHALMOL. 1978 85/2 (230-236)

We developed an apparatus for serial, simultaneous stereophotogrammetric fundus angiography by

modifying a fundus camera. The paired stereoangiograms obtained by this system provided satisfactory stereoscopy and fair depth of field. With this system, mounting and filing of slides were easy. Accurate photogrammetric analysis of the fundus can be performed. Clinical results were impressive in both young and old subjects with fully dilated pupils.

3588. Generation of color images with one-step rainbow holograms - Chen H., Tai A. and Yu F.T.S. - Phys. Dept., Saginaw Valley State Coll., Univ. Cent., Saginaw Valley, Mich. 48710 USA - APPL. OPT. 1978 17/10 (1490-1491)

In this letter the authors demonstrate a technique of constructing true color holographic images using the one-step rainbow holographic technique. This new method is probably the simplest of all the holographic techniques now employed in the generation of true color images.

3589. An edge-enhancing double-focus camera for image processing - Baig W.G. - Philips Res. Labs, Redhill GBR - PHILIPS TECHN. REV. 1977 37/7 (180-187)

In processing pictorial information one of the activities of the human brain is the 'strategic' reduction of data. This is necessary to distinguish essentials from inessentials, and image-processing machines must do something similar if they are to be of any real help. The first step in extracting features from pictures is therefore data reduction. The article describes a camera in which the amount of data is reduced by means of a double-thresholding technique. The new camera produces information that is remarkably free from noise, and at the same time it gives good spatial resolution.

3590. MTF measurement of TV zoom lenses: Influence of distortion on the equivalence of normal and inverse conjugate techniques - Takeda M. and Takeshi K. - Univ. Electrocommunicat., Tokyo JPN - APPL. OPT. 1978 17/14 (2171-2175)

Influence of distortion is studied with regard to the equivalence of the normal and inverse conjugate techniques used in the measurement of MTFs of TV zoom lenses. The two techniques can be regarded as practically equivalent only when the local magnification (as distinguished from the conventional paraxial magnification) is utilized in frequency conversion needed in the inverse conjugate technique. A simple TV zoom lens is presented as a numerical example which supports the results of the discussion. A simple method is proposed for determining the local magnification simultaneously in the process of the MTF measurement.

3591. Incoherent processor for restoring images degraded by a linear smear - Celaya L. and Mallick S. - Lab. Opt., Univ. P./M. Curie, 75230 Paris FRA - APPL. OPT. 1978 17/14 (2191-2197)

An image degraded by linear smear was restored in a spatial filtering setup by using a sinusoidal distribution of amplitude transmittance in the frequency plane. The sinusoidal amplitude distribution was generated with

the help of a Wollaston prism and two linear polarizers. The experimental arrangement permitted the use of an extended incoherent source (angular width of the order of 2°). This provided redundancy in the image formation process and, consequently, eliminated the disturbing diffraction effects which are always present when highly directed light is used. The retrieved image was significantly improved if the degraded amplitude image is transformed by bleaching into a pure phase image, and the filtering is carried out subsequently. Some restored images are shown.

3592. A fast digital TV picture processor - Gross J.G. and Rackette K.H. - Lab. Applicat. Electron., Univ. Louis Pasteur, 67000 Strasbourg FRA - J. PHYS. E. SCI. INSTRUM. 1978 11/4 (336-340)

A general-purpose, programmable hardware system is described which allows the programming of a variety of localised operations commonly used in picture processing and enhancement. A closed-circuit television (CCTV) camera connected to a column video digitiser is used as an input unit, and due to the special structure and instruction set of the system the processing of a picture (512 X 512 elements) can be achieved in about 20 s.

3593. A low-frequency cyclic-loading stage for the SEM - Davidson D.L. and Nagy A. - Southwest. Res. Inst., San Antonio, Tex. 78284 USA - J. PHYS. E. SCI. INSTRUM. 1978 11/3 (207-210)

A cyclic-loading stage for the ETEC Corporation SEM is described. The stage uses servo-controlled electro-hydraulic loading with positive feedback. Specimens are loaded symmetric to the specimen centre line. Maximum load is 4893 N, with a maximum loading rate of 4 Hz. Resolution on the specimen is about 50.0 nm for static observation and 100.0 nm for dynamic (TV rate) observation in the secondary-electron mode. Observation of the specimen may also be made using backscattered electrons and in the channelling mode (channelling patterns and channelling contrast). Maximum specimen motion during cyclic loading is 15 µm.

3594. A sampling scanning electron microscope - Gopinathan K.G. and Gopinath A. - Sch. Electron. Engin. Sci., Univ. Coll. North Wales, Bangor, Gwynedd LL57 1UT GBR - J. PHYS. E. SCI. INSTRUM. 1978 11/3 (229-233)

Sampling circuitry on the lines of that in a sampling oscilloscope has been interfaced with a scanning electron microscope (SEM). This sampling SEM allows the examination of very fast, repetitive voltage waveforms with rise times of the order of 200 ps or less.

3595. A note on the use of local min and max operations in digital picture processing - Nakagawa Y. and Rosenfeld A. - Computer Sci. Cent., Univ. Maryland, College Park, Md. 20742 USA - IEEE TRANS. SYST. MAN CYBERN. 1978 8/8 (632-635)

'Shrinking' and 'expanding' operations on 2-valued digital pictures are useful for noise removal, as well as for detecting dense regions and elongated parts of objects. For gray-scale pictures, the analogs of

shrinking and expanding are local min and max operations. These operations commute with thresholding; thus if they are applied to a gray-scale picture, followed by thresholding, the result is the same as if the picture were first thresholded and shrinking and expanding were then performed. Applying min and max operations prior to thresholding thus makes it possible to defer the choice of a threshold, which may be easier to select after these operations have been performed.

3596. Fourier optical approach to the extraction of morphological parameters from the diffraction pattern of biological cells - Tuerke B., Seger G., Achatz M. and Von Seelen W. - Dept. Biophys., Univ. Mainz, 6500 Mainz GFR - APPL. OPT. 1978 17/17 (2754-2761)

A new procedure for fast quantitative extraction of cell parameters from diffraction patterns was deduced from model calculations and applied to cervical gynecological material. Based on radial scans of the diffraction patterns, the technique permits simultaneous determination of the nuclear and cytoplasmic diameters by Fourier analysis of the radial scanning signals after compensation for the intensity falloff by an amplification proportional to the third power of the radial position in the diffraction plane. Illustrative examples of measurements on exfoliated cells of different types are presented.

3597. Point light source detection characteristics of a SEC vidicon digital TV camera - Dargis A.B. - Bell Lab., Murray Hill, N.J. 07974 USA - REV. SCI. INSTRUM. 1978 49/3 (308-313)

Optimization of the point source detection properties of a Secondary Electron Conduction (SEC) vidicon TV camera tube as a detector of point light sources such as star fields or certain optical spectra requires the accurate determination of peak height, half-peak width, background, and location of the point image. Two perpendicular Gaussian curves have been used to define a point image, allowing changes in the parameters of these Gaussian curves to be used in the study of SEC vidicon point source properties as a function of electrical and optical parameters. Peak height was shown to depend on priming time and a method was developed to reduce the priming time by almost an order of magnitude by momentarily raising the target voltage during priming. Power supply specifications needed for 0.1 pixel (picture element) addressing accuracy were found to be ± 0.03 V. Focus current was optimized to obtain the best sensitivity and resolution over the entire target. Peak height, background, and half-peak width were found to be strongly dependent on readout beam current. Target voltage, over the limited range examined, was found to affect only the gain without compromising other image parameters, so that any value could be used, consistent with gain and sensitivity required.

3598. Aspects of physicochemical methods for the detection of latent fingerprints - Knowles A.M. - Police Sci. Developm. Branch, Home Off., London SW1P 2AW GBR - J. PHYS. E. SCI. INSTRUM. 1978 11/8 (713-721)

This paper reviews physicochemical methods of detecting latent fingerprints on a wide range of materials commonly found at the scene of a crime, with particular emphasis placed on the newer autoradiographic techniques. This is set against a description of studies on the fundamental nature of the latent fingerprint and its host substrate, with a brief review of the history of reagents used in latent fingerprint examination.

3599. The physics of fingerprints and their detection - Thomas G.L. - Police Sci. Developm. Branch, Home Off., London SW1P 2AW GBR - J. PHYS. E. SCI. INSTRUM. 1978 11/8 (722-731)

When a human finger touches a surface a sweat deposit - the fingerprint - remains on the surface. Although several methods are used by the police to detect fingerprints operationally, there is a range of surfaces for which none of these methods is adequate. In order to develop new techniques it is essential that the chemical and physical properties of fingerprints are clearly understood. This review outlines the current state of knowledge in the field of fingerprint physics. Emphasis is placed on physical measurements that have been made on fingerprints. The mechanics of the formation of fingerprints is discussed as well as results of microscopic observations that have led to an understanding of the interaction of fingerprints with flat surfaces. Measurements of contact angles, optical properties and electrical properties of fingerprints are also described. The development of fingerprints by brushing on powder is a well known technique. In this article work on the mechanics of powder adhesion to fingerprints is reported along with two electrostatic methods of fingerprint development. Fingerprints can be developed in vacuo by metal evaporation. research on the mechanism of this method is discussed. This novel technique has recently been introduced for operational police use.

3600. Miniature rotation-free magnetic electron lenses for the electron microscope - Juma S.M. and Mulvey T. - Dept. Phys., Univ. Aston, Birmingham, BE4 7ET GBR - J. PHYS. E. SCI. INSTRUM. 1978 11/8 (759-764)

A rotation-free magnetic electron lens doublet of high magnification is described which is suitable for a transmission electron microscope. In addition a distortion-free image can be obtained at low magnification. The doublet is of unusually compact form, being made some two orders of magnitude smaller in volume and weight than those of a comparable conventional lens unit. This has been made possible by the development of miniature lens windings operating at high current density. Such a design can be scaled up exactly for employment in a million-volt electron microscope. The resulting scaled-up lens is comparable in size with conventional lenses for a 100 kV electron microscope.

4. COMPUTERS

3601. Automated donor recipient identification systems as a means of reducing human error in blood transfusion

- Sherer P.B., Chambers R.W., Taswell H. et al. - Nat. Heart Lung Inst., Bethesda, Md. USA - TRANSFUSION (PHILADELPHIA) 1977 17/6 (586-597)

Clerical and administrative errors are the most common mistakes in blood banking, with errors of sample or patient identification accounting for the majority of mistakes. In an effort to reduce the incidence of human errors, three automated donor-recipient identification systems were developed and were evaluated under clinical conditions. After two years of development and bench testing, each set of equipment was tested, along with established procedures, at a large clinical center, a medium-sized community hospital and a regional donor center. Although none of the systems, as tested, proved acceptable under clinical conditions, a great deal was learned about prototype equipment testing in the clinical setting. Future development of identification systems for clinical use should respond to carefully defined problems, apply in all areas of the hospital or donor center, and be convenient and reliable. The development of the equipment should involve established manufacturers and be subject to exacting preclinical testing.

4.2. Analog computers

3602. Signal processing with charge-coupled devices - Barbe D.F., Baker W.D. and Davis K.L. - Nav. Res. Lab., Washington, D.C. 20375 USA - IEEE TRANS. ELECTRON DEVICES 1978 25/2 (108-125)

The purpose of this paper is to discuss applications of charge-coupled devices in signal processing systems. Both analog and digital CCD concepts are considered. Recent developments in high-speed (~ 100 MHz) CCD's are discussed, and the uses of high-speed CCD and surface-acoustic wave devices together are considered. Examples of the applications of CCD's in electro-optical systems, secure voice communication systems, sonar systems and radar systems are given. Finally, projections for future uses of CCD's in signal processing systems are presented.

3603. True noninverting integrators with single grounded capacitor - Bandyopadhyay A.K. and Nandi R. - Dept. Electron. Telecommunicat. Engin., Jadavpur Univ., Calcutta IND - PROC. IEEE 1978 66/5 (596-597)

Four new active integrator configurations are reported. All the circuits use single grounded capacitors.

3604. High-performance differential quartets - Pookaiyaudom S. and Kuhanont T. - Fac. Engin., King Mongkut's Inst. Technol., Bangkok THA - PROC. IEEE 1977 65/12 (1721-1723)

A new type of differential amplifier is analyzed and experimentally demonstrated. The transconductance is accurately determined by an external resistor and is constant up to 99% of the load current swing. In the absence of the external resistor, very high transconductance is also obtainable.

4.3. Digital computers

3605. Interference suppression by multi-interval integration in analogue-digital convertors - Velasevic D. - Fac. Electr. Engin., Univ. Belgrade, 11001 Belgrade YUG - PROC. INST. ELECTR. ENG. 1977 124/12 (1135-1138)

A generalized conception of multi-interval integration for the solution of the problem of interference suppression in integrating analogue-digital (a.d.) convertors is presented. Three types of multi-interval integration are described, namely nonoverlapped; overlapped and combined. The characteristics of a number of corresponding integration techniques are given in tabular form for several indices of performance particularly chosen for comparison. Special attention is devoted to the increase of the line-frequency suppression. For several integration techniques, an exceptionally high line-frequency suppression, practically without loss in conversion speed, is obtained. Aspects of realization are also discussed.

3606. Man-in-the-loop simulation - Buck J.R., Deisenroth M.P. and Alford E.C. - Sch. Industr. Engin., Purdue Univ., West Lafayette, Ind. 47907 USA - SIMULATION 1978 30/5 (137-144)

This paper describes a man-in-the-loop simulation program which can handle many jobs on a variety of computer systems. The program is intended to aid in the design and improvement of man-machine interfaces. An example of an application is the scheduling of ingots into and out of the soaking pits of a steel mill. This example shows how the program can be employed to improve interface design and operating procedure.

3607. MEDECS, a simulator for mediterranean ecosystems - Miller P.C., Stoner W.A. and Richards S.P. - Syst. Ecol. Res. Group, San Diego State Univ., San Diego, Calif. 92182 USA - SIMULATION 1978 30/6 (173-190)

MEDECS, the mediterranean ecosystem simulator, was developed to model the dynamics of mediterranean-type vegetation in southern California and central Chile. MEDECS is a difference/differential-equation model which simulates the seasonal patterns of resource use and plant response in one-day time steps. It uses submodels of plant growth, decomposition, and inorganic nutrient release to describe the effects of physiological processes, nutrient availability, and environmental parameters. MEDECS is a compartmental model of the producer-decomposer system. In use, it simulates the seasonal progression of changes in each of the compartments. It is being used in on-going research to examine hypotheses about single-species and multiple species (competitive) communities of plants.

3608. An RC logarithmic converter-digitizer - Ben-Yaakov S. and Chen J. ISR - IEEE TRANS. INSTRUM. MEAS. 1978 27/1 (24-26)

Theoretical considerations and experimental data support the suggestion that high accuracy of

conversion and long-term stability could be obtained with a logarithmic RC converter-digitizer. The operation of the proposed converter is based on time measurements of the exponential voltage decay across a linear RC network. Linearity error of this converter, built with commonly available and noncritical components, was found to be less than 0.05% of full scale for a two-decade operation.

3609. A recursive digital filter with maximally flat linear phase at an arbitrary specified frequency - Thajchayapong P. and Lomtong P. - Fac. Engin., King Mongkut's Inst. Technol., Bangkok THA - PROC. IEEE 1978 66/5 (594-596)

An available recursive digital low-pass filter with constant group delay cannot be spectral transformed to give, for example, a bandpass filter which also has constant group delay. This correspondence describes a technique, using Gauss-Jordan elimination, to design a recursive digital filter with maximally flat linear phase at an arbitrary specified frequency.

3610. A simple, highly linear mark: space ratio digital-to-analogue converter - Stockton J.R. - Nat. Phys. Lab., Teddington GBR - J. PHYS. E. SCI. INSTRUM. 1977 10/9 (865-867)

A digital-to-analogue converter linear to about 1 ppm and requiring little adjustment is described. Its accuracy is obtained by a simple, symmetrical application of the mark:space ratio principle.

3611. A highly efficient residue-combinatorial architecture for digital filters - Jenkins W.K. - Dept. Electr. Engin., Univ. Illinois, Urbana, Ill. 61801 USA - PROC. IEEE 1978 66/6 (700-702)

A hybrid digital filter structure is presented that combines a combinatorial multiplication technique with a residue number architecture. The hybrid technique eliminates general multiplication and results in a parallel structure inherent in the residue number system. Results indicate that better speed/cost ratios can be obtained with the hybrid architecture than with either structure alone for applications in which high performance is a predominant factor.

5. SPECIFIC MEASUREMENTS

3612. The sizing of large droplets by laser anemometry - Wigley G. - Mechan. Engin. Dept., Imp. Coll. Sci. Technol., London SW7 2BX GBR - J. PHYS. E. SCI. INSTRUM. 1978 11/7 (639-642)

A laser anemometer operating in the fringe mode has been designed to measure the velocity and size of droplets with diameters between 0.1 and 1.0 mm. The time for the droplet to cross the optical axis is measured and correlated with simultaneous measurement of the droplet velocity to give the droplet size. The system is sensitive to the direction of movement and the size measurement is restricted to the cross-sectional diameter of the droplet. The evaluation was limited to simple droplet flows but an automated system is applicable to sprays of large droplets.

5.1. Temperature measurement

3613. High-precision low-cost temperature controller - Grubic M. and Wuerz U. - Max-Planck-Inst. Biophys. Chem., D-3400 Gottingen GFR - J. PHYS. E. SCI. INSTRUM. 1978 11/7 (692-696)

A temperature controller is described, capable of maintaining the temperature of a properly constructed thermostat constant to within $\pm 5 \mu\text{K}$ for an hour and $40 \mu\text{K}$ for a week in the range from about 280 to 320 K. It uses a thermistor as a sensing element in conjunction with a simple AC Wheatstone bridge. The electronic circuits of the controller, consisting of a lock-in amplifier, a proportional, derivative and integral regulator and a power stage, are built of low-cost, commonly available components. An extension of the temperature range of application is straightforward, but will lead to reduced accuracy.

3614. A precision temperature controller - Lewandowski M. and Randzio S. - Unipan Sci. Instruments, Polis Acad. Sci., Warsaw POL - J. PHYS. E. SCI. INSTRUM. 1977 10/9 (903-905)

A description is given of a fully electronic precision temperature controller. Its construction, properties and operation are described. The temperature setting of the controller is directly calibrated in the temperature range -200 to +500 C using a platinum resistance thermometer. The temperature resolution of the controller amplifier is better than 2×10^5 C and temperature stability of the controller components is better than 10^1 C per 1 C change in external temperature. The typical precision realized with the controller is about 10^1 C. The design of the controller resistance bridge makes the controller a versatile device. It can be used as either a constant-temperature controller, a differential-temperature controller, a temperature programmer with a linearized sensitivity of 1Ω C⁻¹ over -200 to +500 C or a simplified transfer function analyser of thermal systems.

3615. A reliable, low-cost, temperature-controlled oven - Beigang R. and Telle H. - Inst. Angewandte Phys., Techn. Univ., Hannover GFR - J. PHYS. E. SCI. INSTRUM. 1977 10/9 (881-883)

A temperature-controlled oven is described which is inexpensive and easy to construct. The temperature dependent resistance of the filament is used as the temperature sensor. The circuit is based on a low-drift operational amplifier. Long-term stability (more than 20 h) of $\pm 0.6\text{mK}$, a regulation factor of 3.5×10^5 and a reproducibility of $\Delta T/T = 1 \times 10^{-3}$ are reported. The temperature range is essentially limited by the oven material.

3616. An efficient flow cryostat for use between 3.5 and 300 K - Edmonds D.T. and Mailer J.P.G. - Clarendon Lab., Univ. Oxford GBR - J. PHYS. E. SCI. INSTRUM. 1977 10/9 (868-870)

An all-metal flow cryostat is described which will maintain temperatures between 3.5 and 300K. The experimental chamber has an inner diameter of 1.4 cm and the overall outer diameter of the cylindrical cryostat is 2.4 cm allowing its use in a standard 1 in magnet pole gap. The cryostat features simple top

loading at low temperatures and a particularly low refrigerant consumption rate.

3617. High resolution ac calorimeter for organic liquids - Smaardyk J.E. and Mochel J.M. - Dept. Phys., Univ. Illinois Urbana-Champaign, Urbana, Ill. 61801 USA - REV. SCI. INSTRUM. 1978 49/7 (988-993)

A calorimeter has been developed for organic liquids which utilizes the ac heat capacity technique. It can measure heat capacity changes of 1 part in 10^4 with a temperature resolution better than 1 mK from room temperature to 200°C. This calorimeter has been used to study the smectic A to nematic phase transition in a series of homologous liquid crystals.

3618. Wire-packed heat exchangers for dilution refrigerators - Polturak E., Rappaport M. and Rosenbaum R. - Dept. Phys. Astron., Tel-Aviv Univ., Ramat-Aviv ISR - REV. SCI. INSTRUM. 1978 49/3 (305-307)

Very simple wire-packed step heat exchangers for dilution refrigerators are described. No sintering is used in fabrication. Flow impedances and thermal resistance between the liquid and the copper wires are low. A refrigerator with 5 wire-packed heat exchangers in addition to a countercurrent heat exchanger attains a temperature of 11.4 mK with a single mixing chamber and 6.1 mK with 2 mixing chambers. High cooling power is achieved at modest ³He circulation rates.

5.3. Frequency measurement

3619. A digital frequency meter for measuring low frequencies - Mathur M.P. - Dept. Electr. Engin., Reg. Engin. Coll., Kurukshetra, Haryana IND - IEEE TRANS. INSTRUM. MEAS. 1978 27/3 (295-296)

A new technique of measuring low frequencies accurately has been described. The whole scheme can be implemented using TTL integrated circuits.

5.4. Pressure measurement

3620. A simple constant-resistance thermistor Pirani gauge - Onol A. - Phys. Dept., Cekmece Nucl. Res. Cent., Istanbul TUR - J. PHYS. E. SCI. INSTRUM. 1978 11/4 (294-295)

A Pirani gauge that can measure pressures from 10 kPa to 0.10 Pa is described. Two thermistors are used in separate Wheatstone bridges with two operational amplifiers automatically adjusting the voltages to maintain the thermistors at constant temperature. One thermistor measures the vacuum while the other compensates for the ambient temperature changes. A third operational amplifier subtracts the two bridge voltages. The resulting voltage is calibrated in terms of pressure.

3621. A capacitance manometer with a stainless steel bellows sealed membrane - Beg S. - Dept. Phys., Quaid i Azam Univ., Islamabad PAK - J. PHYS. E. SCI. INSTRUM. 1978 11/5 (397-398)

A bakeable differential manometer for comparing a high vacuum system with an unbaked reference system

containing a hydrostatic gauge is described. The principal features of the design are that it can sustain a large pressure difference between the systems and that no special precautions are necessary for protection of the instrument against thermal expansion. Using an electrical bridge technique at a frequency of 2 kHz a pressure difference of about 3.25 Pa can be detected. The device is proposed for measuring pressures in the 0.1 Pa range.

5.5. Flow measurement

3622. Optimal system design for an implantable CW Doppler ultrasonic flowmeter - Di Pietro D.M. and Meindl J.D. - Dept. Electric. Engin., Stanford Univ., Stanford, Calif. USA - IEEE TRANS. BIO-MED ENG. 1978 25/3 (255-264)

A totally implantable telemetry system utilizing custom micropower monolithic integrated circuits has been developed to measure instantaneous pulsatile blood flow in the major arteries of animals. The device utilizes the Doppler effect at ultrasonic frequencies to achieve a flowmeter possessing small size and weight, low power consumption, inherent accuracy, and long-term stability. The integrated circuit electronics package occupies a volume of 3.8 cc and requires a power consumption of 10 mW from a single 1.35 volt mercury cell. The volume of the entire implantable flowmeter package is less than 36 cc. As a micro-miniature radio-telemetry system, the flowmeter can be totally implanted within the body, thereby eliminating the need for wires penetrating the skin, a serious problem with 'back-pack' flowmeters due to danger of infection. The implantable flowmeter system provides a new and necessary tool for accurate quantitative measurements in the study of cardiovascular disease. It has been used in the study of transplanted heart rejection to monitor blood velocity in the major arteries of dogs.

3623. A video system for measuring the blood flow velocity in microvessels - En Fu S. and Lee J.S. - Div. Biomed. Engin., Sch. Engin. Appl. Sci., Univ. Virginia, Charlottesville, Va. 22901 USA - IEEE TRANS. BIO-MED ENG. 1978 25/3 (295-297)

A video correlating system has been developed to measure the velocity of flowing blood in a microvessel. As the velocity of a red blood cell in a microvessel is given by the ratio of distance moved ΔL to the incremental time Δt , we fix Δt in our system according to the framing rate of the video system and employ the video signal to find ΔL by cross correlation.

3624. A simple device for dynamic testing of X-configuration hot-wire anemometer probes - Mulhearn P.J. and Finnigan J.J. - Div. Environm. Mechan., CSIRO, Canberra AUS - J. PHYS. E. SCI. INSTRUM. 1978 11/7 (679-681)

An apparatus is described which was used to test dynamically the response of X-configuration hot-wire anemometer probes to enable a comparison with conventional static calibration to be made. It was found that the static calibration gave acceptable accuracy and that this accuracy was maintained to

surprisingly high levels of the velocity fluctuation. The usefulness of such a device for directly testing a measurement system involving hot-wire anemometry is indicated.

5.8. Density measurement

3625. Optical electronic device for rapid counting and volume determination of suspended particles of 15-1000 μ m in diameter - Laroye G.J., Taylor W.B., Miller R.G. and Phillips R.A. - Dept. Pathol., Ontario Cancer Inst., Toronto CAN - MED. BIOL. ENG. COMPUT. 1978 16/2 (179-187) - summ in GERM, FREN

An optical-electronic counting device for the rapid counting of suspended particles from 15 to 1000 μ m in diameter is described. The device was used to count and size cell colonies, grown in agar, in concentrations ranging from 5 to 3000 per millilitre. The volume distribution of these particles was studied with a pulse-height analyser. At its lower range of sensitivity, the device is able to count large single cells. The counting device is composed of the following: (1) a hydraulic system, constraining the flow of particles to the central core of a region of cylindrical water flow, (2) an optical system which allows colonies to be counted by interrupting a light beam, (3) an electronic counting device quantitating the electronic pulses generated by the light output. Besides applications in the biological laboratory, the device is also potentially useful in areas such as the study of water quality in the environment, and the monitoring of particulate densities in industrial processes.

5.10. Displacement measurement

3626. Synthesis of inductive displacement-measuring system using computer-aided design - Hugill A.L. - Dept. Syst. Sci., City Univ., London EC1V 4PB GBR - PROC. INST. ELECTR. ENG. 1978 125/5 (417-421)

A rigorous method used to model linear variable differential transformers is applied to a variable-inductance displacement transducer. This method known as 'field modeling' uses a knowledge of the magnetic flux distribution within the transducer. This flux distribution is obtained from the solution of Maxwell's equation, with boundary conditions deriving from the geometry and material properties of the transducer. The field equations are expressed in terms of the magnetic vector potential and, with the use of axial symmetry, reduced to an elliptic boundary value problem. This problem is approximated by finite-difference equations and solved, numerically, by the method of successive overrelaxation. A transducer design is modeled, using this method, and the model is used in the synthesis of a displacement-measuring system. The sensitivity of the synthesized system is compared with experimental results obtained from a system with the same design specifications. The sensitivities of the two systems agree to within 2%. The design of the system is then altered, to improve sensitivity, and the sensitivities of the synthesized and experimental systems are again compared.

3627. A directionally insensitive thin-film shear-stress

gauge - Aggarwal J.K. - Dept. Engin. Sci., Univ. Oxford OX1 3PJ GBR - J. PHYS. E. SCI. INSTRUM. 1978 11/4 (349-352)

The design and manufacture of a thin-film probe suitable for measuring the magnitude of wall shear stress in three-dimensional flow are described in detail. The probe has been calibrated in a closed rectangular channel using water as the medium. The calibration is linear and repeatable over the wide range of shear stress covered by experiment, and the variation in the probe output is no greater than 0.25% over the 360° rotation of the probe. It is suitable for instantaneous measurements at frequencies of up to at least 10 Hz. Measurements of wall shear stress made in a semi-cylindrical hollow mounted transverse to the main flow are described. These correlate extremely well with similar measurements of shear stress using an electrochemical technique and with the results of a numerical study, thus indicating the suitability of this probe for such measurements.

5.11. Electrical phenomena

3628. Rapid microwave fixation of rat brain - Moroji T., Takahashi K., Ogura K. et al. - Div. Psychopharmacol., Psychiat. Res. Inst., Tokyo JPN - J. MICROWAVE POWER 1977 12/4 (273-286)

A new microwave device which inactivates brain enzymes rapidly and uniformly is described. From the results obtained with microwave irradiation at two power levels (0.8 kW and 4.5 kW), it has been demonstrated that the high power microwave irradiation has several advantages over the low power irradiation. In its application to neurochemical studies, significant increase in the DOPAC level was found in the irradiated brain, while there were no statistical differences in the levels of NE, DA, 5-HT and 5-HIAA between microwave irradiation and decapitation. Significant increase in the Ach level and marked reduction of the choline level were observed after microwave irradiation. There were no significant differences in the level of cyclic GMP in the brain between the two methods of sacrifice, while significant reduction of the cyclic AMP level was observed in the irradiated brain.

5.11.2. Impedance measurement

3629. Studies of the physical chemistry of planar bilayer membranes using high-precision measurements of specific capacitance - White S.H. - Dept. Physiol., Univ. California, Irvine, Calif. 92717 USA - ANN. N.Y. ACAD. SCI. 1977 Vol.303 (243-265)

The interior of the bilayer is not simply equivalent to a bulk alkyl hydrocarbon, since the enthalpy of transfer from bulk to bilayer for hexadecane is greater than 3 kcal/mol. The solubility of alkanes depends primarily upon the length of the alkane and only secondarily upon molecular volume. The variation in solubility suggests that the bilayer has an interactive or potential volume available for interactions with other molecules roughly equivalent to the volume of the acyl chains. This potential volume can become occupied without significant changes in interfacial organization.

It appears that the interactive volume is maximized by having the double bond in the center of the octadecenoyl acyl chain. It is suggested that the alkane molecules occupy primarily the central zone of the bilayer but may also occupy the interfacial zone to a limited extent, with the longer alkanes having a greater likelihood of occupying the interfacial zone than the shorter alkanes. In the central zone, it is suggested that the presence of the terminal methyl groups of the acyl chains and the greater disorder found there give rise to the positive enthalpy and entropy observed for alkanes of lengths greater than eleven carbons. The qualitative analysis of the data is consistent with having the two monolayers of the bilayer act independently; it appears unlikely that a single alkane molecule spans the bilayer midplane and mixes simultaneously in both monolayers. Perhaps the single most important conclusion from this work is that alkane molecules do not distribute uniformly through the thickness of the bilayer. That is, the bilayer is physicochemically anisotropic normal to the plane of the bilayer. Therefore membrane solutions are unlikely to be true two-dimensional solutions in which thickness is an irrelevant variable. The bilayer also has properties unobserved in three-dimensional solutions, and it therefore seems reasonable to refer to membranes as quasi-two-dimensional solutions.

3630. Electrolyte conductivity apparatus - Rosenthal L.A. - Dept. Electr. Engin., Coll. Engin., Rutgers Univ., Piscataway, N.J. 08854 USA - IEEE TRANS. INSTRUM. MEAS. 1978 27/3 (296-297)

The resistance of an electrolytic cell is measured by passing a square-wave constant current and amplifying/rectifying the voltage developed. A differential recorder provides a record of the conductivity in dynamic mixing studies. The apparatus is extremely simple and reliable and amenable to multiprobe studies.

3631. A digital approach to low frequency dielectric loss measurement - Hanscomb J.R. and Kaahwa Y. - Dept. Appl. Phys., Sch. Phys., Univ. New South Wales, Kensington, NSW AUS - J. PHYS. E. SCI. INSTRUM. 1978 11/5 (406-408)

A small, on line, calculator based measurement system is described for determining capacitance C , conductance G and dielectric loss, $\tan \delta$ in the frequency range 0.4 Hz to 2.0 kHz. The voltage across the sample under test and the current through it are multiplexed into a transient recorder memory and subsequently analysed using least squares curve fitting to yield the amplitudes and phases of these waveforms. Amplitude accuracy is $\pm 0.5\%$ and the maximum error in phase angle difference between current and voltage is $\pm 0.1^\circ$. The system allows large amplitude AC voltages (approx. equal to 100 V peak to peak) to be applied to a sample under study, resulting in increased sensitivity at the lower frequencies. The current is recorded using an operational amplifier connected as a current to voltage converter with virtual ground input.

5.12. Gas concentration measurement

3632. Quantitative continuous measurement of pO_2 and pCO_2 in artery and vein - Pinard E., Seylaz J. and Mamo H. - Lab. Physiol. Pathol. Cerebro-Vasc., Hop. Lariboisiere, Paris FRA - MED. BIOL. ENG. COMPUT. 1978 16/1 (59-64) - summ in FREN, GERM

A technique using a quadrupole mass spectrometer has been developed for the continuous measurement of partial pressures of physiological blood gases. The depletion phenomenon is eliminated with a new sampling cannula equipped with a polyethylene membrane for velocities greater than 1 cm per second. The importance of this development resides in the fact that this phenomenon, which is due to a sampling rate around the cannula in excess of the replacement by the medium of the molecules withdrawn, leads to an under-estimation of the real partial pressure which increases as the blood velocity falls. Thanks to the new cannula, accurate measurements can now be made in both arteries and veins; moreover, continuous observation of physiological phenomena can be carried out with a time constant of under 1 min resulting from the thinness of the membrane.

3633. Skin sensors for continuous oxygen monitoring of newborns - Eberhard P. and Mindt W. - Bio Electron. Dept., F. Hoffmann La Roche Co, Basel SWI - BIOTELEMETRY 1977 4/2 (48-76)

Since the introduction of the technique of cutaneous pO_2 measurement by directly heated oxygen sensors in 1972, the clinical applications and limitations of this new method have been extensively investigated. The method has proven to be of particular value in monitoring of high risk newborns as it affords the possibility of continuously monitoring clinically significant changes in the oxygenation state of the newborn. In this paper, methodological criteria for the assessment of the reliability of cutaneous pO_2 monitoring are discussed. Particular consideration is given to the oxygen and temperature profiles in the vicinity of the skin sensor and to the response time of the sensor. In view of the fact that the cutaneous pO_2 reflects the oxygen partial pressure at the level of arterialized cutaneous tissue, the method has limitations if it is used as an indirect determinant of arterial pO_2 .

3634. In vivo measurement of carbon dioxide tension with a miniature electrode - Olivier C.N., Berkenbosch A. and Quanjer Ph.H. - Dept. Physiol., State Univ., Leiden NLD - PFLUG. ARCH. EUR. J. PHYSIOL. 1978 373/3 (269-272)

A commercially available catheter type electrode with which $P(CO_2)$ can be continuously measured in vivo and in vitro gave progressively less accurate results the longer the measuring period was extended. This proved to be due to temperature effects and a change in sensitivity with time. A correction procedure for these effects was developed which was based on two observations. The relationship between temperature and the logarithm of the sensitivity of the electrode-amplifier combination was linear and virtually identical for 9 electrodes: 8% change in sensitivity for a deviation of $1^\circ C$ from the temperature

during calibration. The change in sensitivity due to drift of the electrode output is approximately a logarithmic function of time: 1 hr after calibration all electrodes exhibited a decreased sensitivity, varying between 0.3 and 16.7%. The drift effect can be dealt with by repeated calibrations, preferably at 1 1/2 hr intervals. The adequacy of the correction procedure was assessed in in vivo measurements in cats and dogs. The mean $P(CO_2)$ difference between the in vivo measurement, corrected for temperature and drift, and samples analyzed with a conventional electrode, was 0.005kPa (0.04 mm Hg) with a standard deviation of 0.187kPa (1.39 mm Hg).

3635. A human calorimeter for the direct and indirect measurement of 24 h energy expenditure - Dauncey M.J., Murgatroyd P.R. and Cole T.J. - Univ. Cambridge GBR - BR. J. NUTR. 1978 39/3 (557-566)

A calorimeter for the continuous measurement of heat production and heat loss in the human subject, for at least 24 h, is described. The calorimeter operated on the heat-sink principle for direct calorimetry and an open-circuit system for indirect calorimetry. Sensible heat loss was measured using a water-cooled heat exchanger, and the temperature of water entering the heat exchanger was controlled to maintain a mean temperature gradient of zero across the chamber walls. Evaporative heat loss was determined from ingoing and outgoing wet-and-dry bulb temperatures and air flow-rates. Problems associated with the calculation of evaporative heat loss and the estimation of the volume of incoming air in open-circuit systems are considered. The calibration, limits of accuracy, sources of error and experiments with subjects are discussed.

3636. Technique for measurement of inert gases in liquids by gas chromatography - Meyer M. - Abt. Physiol., Max-Planck-Inst. Exp. Med., D-3400 Göttingen GFR - PFLUG. ARCH. EUR. J. PHYSIOL. 1978 375/2 (161-165)

A method for quantitative analysis of inert gases in liquids by gas chromatography is described. The technique comprises an equilibration system for partial extraction of dissolved gases from liquids and a gas chromatograph equipped with helium ionization detector. The method is particularly devised for determination of solubility coefficients of gases in liquid materials, e.g. water, aqueous solutions, blood, tissue homogenates, and for simultaneous measurement of several inert gases dissolved in liquids. Coefficients of variation for serial analyses of individual samples were $\leq 3\%$. The method is applicable to studies of blood-tissue transfer of respiratory and inert gases.

3637. Ocular hazard from uv laser exhibiting self-mode-locking - Zuclich J.A. and Taboada J. - Technol. Incorporat. Life Sci. Div., San Antonio, Tex. 78216 USA - APPL. OPT. 1978 17/10 (1482-1484)

The authors report retinal damage induced by 325-nm He-Cd laser radiation at considerably lower energy doses than required to produce either corneal or lenticular damage. The unexpectedly low retinal threshold prompted beam diagnostic testing of the He-

Cd laser which resulted in the observation of self-mode-locking of the laser output at 325 nm.

5.14. Radiation measurement

3638. Tomographic imaging with nuclear magnetic resonance - Crooks L.E., Grover T.P., Kaufman L. and Singer J.R. - Dept. Radiol., Univ. California, San Francisco, Calif. USA - INVEST. RADIOL. 1978 13/1 (63-66)

A technique is described for obtaining tomographic images of hydrogen distribution in animals using nuclear magnetic resonance (NMR). Resonant frequency is proportional to magnetic field strength, so that spatial resolution is achieved by frequency selection and magnetic field shaping. The results of scanning a phantom and two rats are presented.

5.14.1. Visible light

3639. Displaying distortion in ophthalmic lenses - Fry G.A. - Coll. Optom., Ohio State Univ., Columbus, Ohio 43210 USA - AM. J. OPTOM. PHYSIOL. OPT. 1977 54/5 (282-285)

A procedure is outlined for generating and displaying information about distortion in an ophthalmic lens. It involves a direct comparison of an object and its image as viewed at the entrance pupil of the eye. The same procedure may also be used to assess chromatic dispersion produced by the chromatic differences in magnification.

3640. In vivo measurement of calcium by the ^{37}Ar method: A study of the effect of recirculating breath collection systems on the exhalation rate - Leach M.O., Bell C.M.J., Thomas B.J. et al. - Dept. Phys., Univ. Birmingham GBR - PHYS. MED. BIOL. 1978 23/2 (282-290) - summ in FREN, GERM

A study has been made of the effect that different methods of breath collection have on the measurement of calcium in vivo by the $^{40}\text{Ca}(\text{n},\alpha)^{37}\text{Ar}$ method. The effect of open and rebreathing breath collection methods has been examined by using intravenous injections of ^{133}Xe . This study has indicated that comparison of calcium measurements between individuals and between centres is likely to be accurate only if breath is collected on 'open circuit'.

3641. Comments on nondestructive microscopy - Marton L. - Smithsonian Inst., Nat. Mus. Hist. Technol., Washington, D.C. 20560 USA - ANN. N.Y. ACAD. SCI. 1978 VOL.306 (156-157)

Difference image analysis on a series of high-resolution exposures (reciprocal space limit $\sim 1/3 \text{ \AA}^{-1}$) of a thin Al_2O_3 foil leads to the recognition of individual heavy atom and light atomic details. They correspond to the deposition and separation of single atoms and of small groups of atoms under the influence of radiation. The difference patterns in successive difference patterns in successive difference images show structural connections.

3642. Phase fluorometer for measurement of picosecond processes - Haar H.P. and Hauser M. - Inst. Physikal.

Chem., Univ. Stuttgart, D-7000 Stuttgart 80 GFR - REV. SCI. INSTRUM. 1978 49/5 (632-633)

Time-dependent fluorescence processes can be investigated using a phase fluorometer with variable frequency. The high cutoff frequency of 500 MHz leads to a time-resolving power of about 1 ps.

3643. Simple laser pulse energy monitor - Smirl A.L., Shoemaker R.L., Hambenne J.B. and Matter J.C. - Phys. Dept., North Texas State Univ., Denton, Tex. 76203 USA - REV. SCI. INSTRUM. 1978 49/5 (672-673)

A simple and inexpensive relative energy monitor for short laser pulses is described. The three basic units of this system are an integrating detector circuit, an amplifier, and a peak detector and hold circuit. With this new device one can measure optical pulse energies (at $1.06 \mu\text{m}$) as small as 1.0 nJ with an electronic accuracy of $\sim 1\%$

3644. Fourier transform spectroscopy in the visible and ultraviolet range - Luc P. and Gerstenkorn S. - CNRS II, Lab. Aime Cotton, 91405 Orsay FRA - APPL. OPT. 1978 17/9 (1327-1331)

In cases where the photon noise is the limiting factor, the multiplex gain is not always conserved; however the throughput (Jacquinot's advantage) is not affected. Therefore extension of Fourier transform spectroscopy to higher frequencies has great possibilities. Studies at high resolution, both in emission and in absorption, show that the performance achieved by Fourier transform spectroscopy in the visible and uv range is comparable with that reached in the ir.

3645. Time-resolving high-intensity laser-light detectors: A possible new photoconductive device - Fillard J.P., De Murcia M. and Alchalaby K. - Lab. Phys. Solides III, Cent. Etud. Electron. Solides, Univ. Sci. Techn. Languedoc, Montpellier FRA - PROC. IEEE 1978 66/5 (602-604)

High-power laser-light detectors belong to 2 main categories: integrated-response detectors (joulemeter) or time-resolving detectors (photomultiplier or high-gain fast diodes). It is shown in this paper that photoconductive materials, such as stannic oxide monocrystals, can reconcile the specifications of both categories: mechanical and thermal strength, response time, linearity, and so on.

3646. Photoelectronic phase and frequency modulation - Azzam R.M.A. - Univ. Nebraska Med. Cent., Omaha, Nebr. 68105 USA - PROC. IEEE 1978 66/5 (606-607)

Phase and frequency modulation can most directly be effected by a nonlinear device whose output is a sinusoidal function of its input. While no electronic device exhibits this property, electrooptical systems can be designed with exactly this sinusoidal nonlinearity. This provides the basis for novel schemes of PM and FM.

3647. Proposed instrumentation for analytical video stereoscopy of extended images - Real R.R. - Div. Phys., Nat. Res. Council, Canada, Ottawa, Ont. K1A

An approach to real-time photogrammetry is outlined using video techniques in order to combine precision coordinate control of stereo-related images with image enhancement and processing while viewing the stereo model, thereby facilitating photointerpretation in certain applications. One variant replaces the stereo optical paths of an analytical plotter with TV cameras, video signal processing and binocular displays; a second has video disk inputs of stereo-related imagery.

3648. Automatic cut-out unit for photomultiplier tubes -
Gough W. - Viriamu Jones Lab., Dept. Phys., Univ. Coll., Cardiff GBR - J. PHYS. E. SCI. INSTRUM. 1977 10/9 (868-868)

A circuit is described which will automatically cut off the EHT supply to a photomultiplier tube if accidental overload of the tube should occur. The EHT remains cut off, and resetting must be done manually.

3649. Synchronized flash photolysis and pulse deposition in matrix isolation experiments -
Allamandola L.J., Lucas D. and Pimentel G.C. - Lab. Astrophys., Huygens Lab., 2300 RA Leiden NLD - REV. SCI. INSTRUM. 1978 49/7 (913-918)

An apparatus is described which permits flash photolysis of a pulse-deposited gas mixture in a matrix isolation experiment. This technique obviates the limitations of in situ photolysis imposed by the cage effect and by secondary photolysis. The matrix is deposited in pulses at 30-sec. intervals and photolyzed sequentially by four synchronized flashlamps approximately 1 msec before the pulse strikes the cold surface. Pulsed deposition maintains adequate isolation and causes line narrowing, which enhances spectral sensitivity. The efficacy of flash photolysis combined with pulsed deposition for producing and trapping transient species was demonstrated by infrared detection of CF_3 (from photolysis of $\text{CF}_3\text{I}/\text{Ar}$ mixtures) and of CICO (from photolysis of $\text{Cl}_2/\text{CO}/\text{Ar}$ mixtures). The apparatus was used to study the photolytic decomposition of gaseous tricarbonylironcyclobutadiene, $\text{C}_4\text{H}_4\text{Fe}(\text{CO})_3$. The results indicate that the primary photolytic step is not elimination of C_4H_4 , as suggested earlier, but rather of CO.

3650. Methods for drift stabilization and photomultiplier linearization for photometric ellipsometers and polarimeters -
Aspnes D.E. and Studna A.A. - Bell Lab., Murray Hill, N.J. 07974 USA - REV. SCI. INSTRUM. 1978 49/3 (291-297)

The authors describe simple modifications to photometric polarimeter and ellipsometer systems that greatly reduce nonlinearity, component drift, and digital noise effects. A photomultiplier feedback circuit is described and analyzed that varies the effective system linearity by means of a single control. Linearity to 5×10^{-4} over more than 3 orders of magnitude of incident light intensity is obtained. Effective double-beam stability to 5×10^{-5} is achieved by blocking the source intensity over part of an extended measurement

cycle. These refinements permit photometric instruments to approach accuracy capabilities compatible with their precision capabilities, and also allow measurements to be made in the presence of ambient scattered light, at high sample temperatures, or using solid-state detectors for which the zero reference is not well defined. As an example, the authors give the dielectric function of Ge measured from 1.5 to 5.8 eV at a sample temperature of 800°C.

5.14.2. Ultraviolet radiation

3651. A new apparatus for the delivery of high intensity UVA and UVA+UVB irradiation, and some dermatological applications -
Plewig G., Hofmann C., Braun Falco O. et al. - Dept. Dermatol., Univ. Munich GFR - BR. J. DERMATOL. 1978 98/1 (15-24)

A new apparatus consisting of a 200 W super pressure mercury lamp and a flexible light guide with a liquid light conducting core is presented. Its transmission for UVA irradiation is more than threefold as compared to conventional quartz fiber optic bundles. The light guide is capable of transmitting density levels exceeding $1 \text{ W}/\text{cm}^2$. UVA and UVB are transmitted. By inserting a filter platelet (WG 345) into the light guide the UVB is cut off. The output of the unfiltered guide is 700 mW ($3570 \text{ mW}/\text{cm}^2$), of the filtered guide 400 mW ($2040 \text{ mW}/\text{cm}^2$), centered mainly at 366 nm. The light apparatus proved useful for several dermatological applications. It replaces in many respects conventional Kromayer lamps, especially because the flexible light guide, which is 160 cm long and weighs only 210 g, can be brought into direct contact with the skin. Results of determining the minimal erythema dose (MED), of phototesting (8-MOP photoallergy, persistent light reactor, erythropoietic protoporphyria) and of photochemotherapy are given.

3652. An electronic chopper for a low-power UV source -
Handsworth R.J. and King W.D. - Div. Cloud Phys., CSIRO, Epping, NSW AUS - J. PHYS. E. SCI. INSTRUM. 1978 11/8 (744-745)

A circuit which allows the OZ4 germicidal lamp to be chopped electronically at frequencies between 5 Hz and 5 kHz is described. The waveform of the chopped radiation has a rise time of 20 μs and a pulse-to-pulse reproducibility of better than 0.5%.

5.14.3. Infrared radiation

3653. Hyperbolic cone channel condenser -
Gush H.P. - Dept. Phys., Univ. British Columbia, Vancouver CAN - OPT. LETT. 1978 2/1 (22-24)

An optical condensing system is described that consists of a lens and the polished interior of a cone generated by rotating a hyperbola about an appropriate axis. An optimum concentration of light is achieved in a relatively compact system. In certain circumstances the hyperbola reduces to a straight line, simplifying the construction of the cone.

3654. Air pollution measurement by Fourier transform spectroscopy -
Hanst P.L. - US Environm. Protect.

Agency, Research Triangle Park, N.C. 27711 USA - APPL. OPT. 1978 17/9 (1360-1366)

The use of infrared methods in pollution measurement has been hampered by sensitivity limitations and by interferences from water vapor. Fourier transform spectrometer systems reduce these limitations by their high optical efficiency and their ability to manipulate spectra for removal of interfering bands. At the Environmental Protection Agency we have sought to further increase the sensitivity of the infrared techniques by evolving optimal long path cell designs and sample concentration techniques. Reactive pollutants such as O_3 , H_2O_2 , HNO_3 , HNO_2 , H_2CO , $HCOOH$, PAN, HCl, NH_3 , NO, and NO_2 are best measured in the open atmosphere. In this case one strives toward large absorption cells with the paths as long as practical. Our largest cell is being used to measure pollutants in the smog at Riverside, California. This cell uses an eight-mirror system for multiple-passing radiation along a 23-m base path, yielding total paths measured in kilometers. Reactive gases at levels of just a few ppb have been measured. For measuring nonreactive pollutants, such as hydrocarbons and halocarbons, maximum detection sensitivity is achieved with small folded-path cells rather than with large cells. In this case a pollutant concentrate is prepared and introduced into a miniaturized multiple-pass cell designed for maximum path-to-volume ratio. Cryogenic trapping to separate the pollutants from the major constituents of the air has yielded concentration factors as high as one million. The smallest multiple-pass cell we have built to date encloses a 115-cm light path within a volume of 3 cm^3 . This cell when used with the FTS spectrometer and mercury-cadmium-telluride detector permits the detection of nanogram quantities of pollutant gases. Measurements have been made of trace gases in the air at mixing ratios as low as 2×10^{-11} .

3655. Recent applications of FT-IR spectroscopy to polymer systems - Koenig J.L. and Antoon M.K. - Dept. Macromolec. Sci., Case West. Reserve Univ., Cleveland, Ohio 44106 USA - APPL. OPT. 1978 17/9 (1374-1385)

Fourier transform infrared spectroscopy has recently become an important analytical method for investigation of many polymer systems. Several new methods, concerned primarily with digital subtraction of absorbance spectra, are presented. Applications of the method to synthetic polymer research include conformational and configurational analyses, elucidation of degradation mechanisms, and interactions with filler surfaces. Many researchers in the biopolymer and medical fields have utilized the sensitivity and digital data processing capabilities of FT-IR to obtain information inaccessible by other methods.

3656. New trends in the application of Fourier transform infrared spectroscopy to analytical chemistry - Hirschfeld T. - Block Engin. Inc., Cambridge, Mass. 02139 USA - APPL. OPT. 1978 17/9 (1400-1412)

Four major trends will characterize the evolution of Fourier transform spectroscopy's analytical laboratory

applications in the remaining seventies and early eighties: A more thorough analysis of the nonidealities of real FT-IR systems will allow the quantitative accuracy of FT-IR to approach its SNR capability, or to be corrected to this level; The power of FT methods is severely mismatched to current practice and habits in the infrared analytical laboratory. New operating procedures, combination techniques such as GCIR (a much better match to FT-IR capabilities) and more demanding spectroscopic techniques, will become more common. In the wake of this development, greater emphasis will be placed on automatic sample preparation and interpretation; At the same time, the importance of spectra as the final output of spectroscopic measurements will decrease. Instead, higher order spectroscopic functions, or even final analytical data, will become a frequent instrumental output, with or without high level operator interaction; The domain of application of Fourier transform spectroscopy will see steady extension into new spectral regions, such as the near infrared and UV-VIS regions, while its extension to Raman spectroscopy still appears elusive. The analysis embodies a strong conservative bias, in that it excludes from consideration the consequences of new technology. This also insures its relevance to currently existing instrumentation.

3657. Visible-infrared window assembly for ultrahigh vacuum systems - Wierenga P.E., Mollenhorst G.J. and Wikkerink A.T.B. - Dept. Appl. Phys., Twente Univ. Technol., Enschede NLD - REV. SCI. INSTRUM. 1978 49/3 (408)

A window assembly for ultrahigh vacuum systems is described which uses Irtran 4 visible-infrared transmitting optical material. The assembly is made in a standard ultrahigh vacuum flange. The window is sealed in place with Pyroceram. The assembly can be repeatedly heat-cycled up to 200°C without failure.

5.14.4. Radiowaves

3658. Nonstationary nonlinear theory of O type resonant generators - Shmat'ko A.A., Tretiykov O.A. and Vavriv D.M. - Lab. Appl. Mathemat. Phys., Techn. Univ. Denmark, Lyngby DNK - RADIAT. EFFECTS 1978 35/4 (193-199)

A nonstationary nonlinear theory of electron-wave interaction has been developed for microwave resonant generators. The system of the integro-differential equations determining the amplitude and phase of the excited oscillations in the high Q-resonant system is obtained. For most cases the solutions of the nonstationary nonlinear interaction equations have been found numerically. However, in certain cases such as in the linear region and in the steady-state of the excited oscillations analytical treatments are developed. Transient performances of the radiation of the electron beam and the estimates for the starting current and the amplitude of the stationary oscillations are presented. The application of the obtained equations for the generator pulse is discussed. The solution for the equation of motion is solved and the oscillation period of the electrons in the wave field is determined

analytically.

3659. Dielectric relaxations of emulsions of saline aqueous solutions - Le Petit J.P., Delbos G., Bottreau A.M. et al. - Lab. Thermodynam., Univ. Pau Pays de l'Adour, Pau FRA - J. MICROWAVE POWER 1977 12/4 (335-340)

The complex permittivity of emulsions of KCl aqueous solutions has been measured at room temperature from 1 MHz up to 38 GHz. In each sample the aqueous solution is dispersed in the emulsifying medium in droplets, a few microns in diameter. The results obtained reveal the absorption band related to interfacial polarization phenomena and the absorption band due to the dielectric relaxation of the dispersed solution. The frequency positions of these bands in relation to the proportion in volume and the saline concentration of the dispersed solution, have been studied. As theoretical calculations led us to expect, the absorption band of interfacial polarization moves to higher frequencies when the conductivity of dispersed solution increases, and the absorption band due to the dielectric relaxation of the dispersed liquid phase is at higher frequencies than that of the same liquid when non-dispersed.

3660. Potentially hazardous microwave radiation sources: A review - Stuchly M.A. CAN - J. MICROWAVE POWER 1977 12/4 (369-381)

An increasing proliferation of microwave sources and their continuously broadening scope of applications result in the necessity of an assessment of the potential radiation hazards in various situations. Recently there has appeared quite a large number of references dealing with specific sources. This paper provides a review of various microwave radiation sources to assist in a general understanding of the basic characteristics of the sources which are pertinent to microwave radiation hazards.

3661. Minimum detectable pollutant concentrations with Stark modulated microwave spectroscopy - Nigh F.M. and Brodwin M.E. - Dept. Electr. Engin., Northwest. Univ., Evanston, Ill. 60201 USA - IEEE TRANS. INSTRUM. MEAS. 1978 27/1 (89-93)

A general theory for the prediction of the minimum detectable concentration using a Stark modulated microwave spectrometer has been developed. This theory relates the characteristics of the molecular rotational resonance of the polar gas and the instrument parameters. The theory shows that the instrument is most sensitive when sufficient microwave power is used to produce saturation and the sample pressure is increased to a value which is limited by the dielectric breakdown of the Stark voltage modulating the gas. Experimental verification using NH_3 with N_2 as the background gas was performed. A minimum detectable concentration of 8 ppm was observed at a pressure of 1 mm with a spectrometer sensitivity of -135 dBm.

3662. A microwave irradiation chamber for scientific studies on agricultural products - Olsen R.G., Geithman G.A. and Schrader D.H. - Dept. Electr. Engin.,

Washington State Univ., Pullman, Wash. 99163 USA - IEEE TRANS. MICROWAVE THEORY TECH. 1977 25/5 (428-433)

The design and testing of a chamber for uniform heating of objects with an intense microwave field is described. Methods for direct and inferred microwave field is described. Methods for direct and inferred measurement of temperature in the microwave field during irradiation are discussed. A theoretical analysis was made to determine the range of electrical parameters for which heating will be uniform. This analysis was verified experimentally. Curves for determining the rate of energy absorption in cylindrical posts are given for a wide range of electrical parameters.

3663. Autonomic network measurements in the time domain - Andrews J.R. - Nat. Bur. Standards, Boulder, Colo. 80302 USA - PROC. IEEE 1978 66/4 (414-423)

The time-domain automatic network analyzer (TDANA) is described. It utilizes time-domain measurement and the fast Fourier transform to obtain frequency-domain scattering parameters. A TDANA consists of a pulse generator, sampling oscilloscope, and a minicomputer. The present state of the art for TDANA's includes frequency coverage from dc to 18 GHz in a single instrument and complex scattering parameter measurement uncertainties of the order of 1%.

5.14.5. Roentgen radiation

3664. An instrument with digital readout for indirect determination of kVp - Chaney E.L. and Hendee W.R. - Mem. Med. Cent., Savannah, Ga. 31405 USA - MED. PHYS. 1978 5/2 (141-145)

An electronic instrument with digital readout has been designed and constructed for indirect determination of the kVp applied to diagnostic x-ray tubes. The signals from two detectors exposed simultaneously to a differentially filtered x-ray beam are processed by analog computing circuitry to yield an output signal directly proportional to the applied peak kilovoltage. Theory and preliminary results are presented and discussed.

3665. Energy dependence of correction factors for two models of Keithley diagnostic ion chambers - Morgan T.J., Brateman L. and Dirkse J. - Div. Electron. Prod., Bur. Radiol. Hlth, Food Drug Adm., Rockville, Md. 20857 USA - MED. PHYS. 1978 5/2 (162-163)

The energy dependence for each of two models of ionization chambers compatible with the Keithley model 35020 Digital Dosimeter, is determined by measurement of the exposure correction factors determined over the diagnostic x-ray range (0.4-4.9 mm AL HVL) for several samples of each model. The results of an analysis of variance performed by model on the correction factors are reported as mean correction factors for the x-ray beams evaluated, with a relative standard error of less than 1% for both cases. Energy-dependence curves for the two chamber models are given, and their use is described.

3666. 25 MV X-ray beam characteristics from a 35 MeV linear accelerator - Purdy J.A., Keys D.J. and Abrath F.G. - Phys. Sect., Div. Radiat. Oncol., Edward Mallinckrodt Inst. Radiol., Washington Univ. Sch. Med., St Louis, Mo. 63130 USA - INT. J. RADIAT. ONCOL. BIOL. PHYS. 1978 4/3-4 (337-343)

This manuscript presents characteristic dosimetry measurements for the 25 MV X-ray beam from the Varian Associates Clinac® 35 linear accelerator. The quality of the beam is expressed by its attenuation as a narrow beam in lead. Percentage depth dose tables are given as a function of field size for square fields. Tissue-phantom ratios are tabulated for square field sizes. A study of the variation of the dose in the buildup region demonstrates that surface dose and the depth of maximum dose is a strong function of the field size. Other beam parameters measured and discussed include field flatness and symmetry, penumbra, and applicability of inverse square law.

5.14.6. Alpha, beta and gamma radiation

3667. Estimation of organ depth by gamma ray spectral comparison - Koral K.F. and Johnston A.R. - Dept. Pure Appl. Phys., Queen's Univ., Belfast ENG - PHYS. MED. BIOL. 1977 22/5 (988-993)

In order to measure the amount of radioactive tracer taken up by an organ in the human body, it is necessary to determine the depth of the organ in the body. Two techniques for determining organ depth employing a single gamma ray detector in a fixed position have been published. The first method involved analysis of the valley-to-peak ratio for the full-energy photopeak measured with an uncollimated detector. The second method employed two isotopes with gamma rays of widely different energies, ^{131}I and ^{125}I , and a collimated detector. The procedure presented here is similar to the valley-to-peak method but involves analysis of the entire pulse height spectrum. Measurements are made on ^{131}I with a water phantom and a single collimated detector in a fixed position. A set of calibration spectra are taken for a source at depths ranging from 2 to 15 cm in 1 cm increments. Then test spectra are taken for fixed times with sources placed at various depths. By comparing a test spectrum with the calibration spectra, it is possible to calculate the source depth. The method is checked for dependence of calculated depth on source thickness and on background concentration.

3668. Corrections to megavoltage depth-dose values due to reduced backscatter thickness - Goede M.R., Anderson D.W. and McCray K.L. - Dept. Radiol. Sci., Univ. Oklahoma Hlth Sci. Cent., Oklahoma City, Okla. 73190 USA - MED. PHYS. 1977 4/2 (123-126)

Multiplicative corrections for percent depth-dose values were measured for situations with nonmaximal backscatter because of reduced thickness of the irradiated phantom. Data were obtained for common clinical field sizes for a ^{60}Co beam as well as beams from a 2.5-MV and a 4.0-MV generator. Functional forms, which summarize the results and include field size effects, depth, and the thickness of the backscatter medium as variables, were obtained by regression

analysis.

3669. Physical characterization of 45-MV photon beams for use in treatment planning - Suntharalingam N. and Steben J.D. - Dept. Radiat. Ther., Thomas Jefferson Univ. Hosp., Philadelphia, Pa. 19107 USA - MED. PHYS. 1977 4/2 (134-140)

Central-axis percentage depth doses and tissue-maximum ratios (TMR) for 45-MV photon beams from a betatron have been measured in water. Also the influence of field size and collimator scatter on the dose in the buildup region have been investigated. The maximum dose for TMR has been shown to occur at a point about 2 cm deeper than the maximum dose for percentage depth dose. This difference is significant in the characterization of the photon beam at this high energy. The measured physical data have been computerized for the use in routine treatment planning. Computer-generated beams have been found to be in close agreement with measured isodose curves. Computer-generated isodose distributions for typical clinical irradiation techniques have been verified using RP/V film in an Alderson phantom.

3670. A simple device for efficient transfer and unit dose packaging of Xe-127: concise communication - Kowalsky R.J., Dalton D.R. and Saylor W.L. - Univ. North Carolina Sch. Pharm., Chapel Hill, N.C. USA - J. NUCL. MED. 1978 19/4 (414-418)

An inexpensive system has been devised for the efficient transfer of Xe-127 gas from the manufacturer's ampule into individual dose vials for patient use. By displacing the gas with an aqueous solution, the initial transfer is made from an ampule of known activity into an evacuated serum vial of predetermined volume with transfer efficiency greater than 99%. A similar principle is used to transfer Xe-127 from the stock serum vial into individual dose vials, with total xenon recovery exceeding 98%. Ability to deliver the desired activity to each vial is within 90-110% of that predicted by calculation. Reproducibility in delivering a given activity was excellent, with all vials falling between 95 and 105% of the mean activity. Stability studies showed that 94% of the Xe-127 activity can be removed from the vials with only 6% absorbed in the rubber stopper after 5 wk of storage. The device costs less than \$25.00 and can be constructed easily from common laboratory materials.

3671. Display systems in nuclear medicine - Brill A.B. and Erickson J.J. - Dept. Radiol. Radiol. Sci., Vanderbilt Univ., Nashville, Tenn. USA - SEMIN. NUCL. MED. 1978 8/2 (155-161)

Image display has traditionally been implicated as the limiting factor in the usefulness of digital data processing in nuclear medicine. This was partly due to limited technology and partly to an attempt to use a single system for all displays. Because of the widely varying characteristics of the various nuclear medicine procedures, no single system can perform optimally in all studies. The various uses for the display in data processing are? user interaction, feature extraction, quantitative parameter estimation, correlation with previous studies and reporting. User interaction poses

the least stringent requirements on the display. Typewriters, line printers, and standard computer terminals are adequate for this mode of operation. Display of monitor images to allow the operator to follow the processing of the data requires only a moderate quality display, and, for this, a storage scope display or gray scale with a limited number of gray scales is useful. Interactive displays, which are used to guide the processing, must have some means of allowing the user to indicate regions of interest. Joysticks, cursors, or graphic tablets can perform this function. For display of images to be used for diagnostic interpretation, a high-quality image must be produced, which allows the entire dynamic range of data to be shown to the clinician. Printing of multiple images on an electrostatic plotter or on film used in a flying-spot scanner mode can provide the clinician with such images. Display of dynamic data places another restriction on the system in that not only must spatial distribution be represented, but the temporal distribution of activity must also be shown. This is approached in one of three ways. If the problem is one of changing organ size, as in a cardiac ventricular ejection fraction measurement, then the overlaying of the organ edges as a function of time, along with a curve of the change in the area (or counts) as a function of time, is adequate. If, however, the problem is one of measuring a single organ function as a function of time as in a cardiac bolus study where the presence of a shunt is suspected, then one can use time-coded color displays in which the activity distribution in selected time segments is displayed in different colors. In this case, the overlapping activity areas are shown as the summation of the individual colors, while the nonoverlapping areas remain in their respective colors.

3672. Improved electromagnetic velocity drive for Mossbauer experiments - Genand-Riondet N., Imbert P. and Lericque J.F. - Div. Phys., Serv. Phys. Solide Resonance Magnet., 91190 Gif sur Yvette FRA - REV. SCI. INSTRUM. 1978 49/5 (606-609)

The authors describe a velocity drive for Mossbauer spectroscopy, which uses a velocity transducer with a moving magnet core positioned between two symmetrically arranged drive coils. Among other advantages this device improves the feedback performance by suppressing the fundamental resonance frequency in the moving rod.

3673. A simple microprocessor Mossbauer spectrometer - Player M.A. and Woodhams F.W.D. - Dept. Nat. Philosophy, Univ. Aberdeen, Aberdeen AB9 2UF GBR - J. PHYS. E. SCI. INSTRUM. 1978 11/3 (191-192)

A Mossbauer spectrometer based on the Motorola MEK 6800DI microprocessor kit is described and shown to provide a simple, cheap and flexible alternative to conventional multichannel analyser systems.

5.14.7. Neutrons

3674. A chopper for neutron pulse propagation

experiments - Hanna N.N. - Dept. Nucl. Engin., Univ. Manchester GBR - J. PHYS. E. SCI. INSTRUM. 1977 10/11 (1167-1169)

An intense neutron pulse with a wide frequency spectrum was required for pulse propagation experiments. The neutron beam emanating from the thermal column of the Universities Research Reactor (URR) was modulated by an improved rotary chopper of 86 cm diameter, operating at 2000 rev min⁻¹ and containing boron and cadmium absorbers. The cross-sectional area of the pulsed beam was 26 cm². The pulses had a 3 dB cut-off frequency of about 1000 Hz and a signal-to-background ratio of about 400.

5.14.8. Cosmic radiation

3675. Ames collaborative study of cosmic ray neutrons: mid-latitude flights - Hewitt J.E., Hughes L., Baum J.W. et al. - Ames Res. Cent., NASA, Moffett Fields, Calif. 94035 USA - HEALTH PHYS. 1978 34/4 (375-384)

Cosmic ray neutron flux densities, neutron dose equivalent rates, and exposure rates for ionizing radiation were measured in a series of flights at 12.5 km (41,000 ft) in an Ames Research Center flight-altitude aircraft. Instrumentation and analysis techniques were used which had been developed to measure accelerator-produced radiation. Neutron instrumentation consisted of Bonner spheres, threshold detectors, a moderated BF₃ counter, and a liquid scintillation spectrometer. A dose-equivalent meter from Brookhaven National Laboratory and an argon-filled ionization chamber were also flown. On three flights at average geomagnetic latitudes of 45, 38, and 48°N the neutron dose equivalent rates were 0.20, 0.14, and 0.22 mrem/hr. The corresponding exposure rates from the ionizing component were 0.37, 0.31, and 0.41 mR/hr. As measured by the liquid scintillation counter, the dose equivalent from 3- to 13-MeV neutrons is 30% of the total for all neutrons. The flux measured in this energy range agrees with the calculated values of Armstrong (Ar73). At a geomagnetic latitude of 43°N, a plot of the exposure rate against the pressure altitude yielded a relaxation length of 140 g/cm². Simultaneous measurements of the neutron and ionizing components verified that the former is more sensitive to changes in geomagnetic latitude. A neutron spectrum derived from Bonner sphere measurements indicates that the flux densities in the Hess spectrum may be two or three times too high and that the evaporation bump at 1 MeV may not exist.

5.14.9. Sound

3676. A real time ultrasonic imaging system for carotid arteriography - Green P.S., Taenzer J.C., Ramsey S.D. Jr. et al. - SRI Internat., Menlo Park, Calif. 94025 USA - ULTRASOUND MED. BIOL. 1977 3/2-3 (129-142)

A real-time ultrasonic imaging system for the noninvasive assessment of atherosclerotic vascular disease has been developed. This instrument displays cross-sectional images of the artery and surrounding tissues plus superimposed profiles of blood flow within

the vessel. The anatomical structure is depicted by a 10-MHz B-scan subsystem operating at 15 frames/sec. An instantaneous profile of the blood flow velocity is produced by a 5-MHz pulsed Doppler subsystem that can display the velocity at up to 20 individual points along a line segment intersecting the artery. Cross-sectional high-resolution gray-scale images, both transverse and longitudinal, of the major vessels in the neck in the region of the carotid bifurcation are presented. These images also demonstrate the skin, subcutaneous fat, muscle, and thyroid gland. Estimates of severity of atherosclerotic disease measured as percentage of lumen diameter obstructed by each lesion, are essentially the same as subsequent estimates made using roentgen angiography. Pulsating blood flow profiles in the common carotid have been clearly displayed; however, clinical applicability of the Doppler subsystem is not yet demonstrated.

3677. A new ultrasonic real-time scanner featuring a servo-controlled transducer displaying a sector image - Skolnick M.L. and Matzuk T. - Dept. Radiol., Univ. Pittsburgh Sch. Med., Pittsburgh, Pa. USA - RADIOLOGY 1978 128/2 (439-445)

This paper describes a new real-time servo-controlled sector scanner that produces high-resolution images similar to phased-array systems, but possesses the simplicity of design and low cost best achievable in a mechanical sector scanner. Its unique feature is the transducer head which contains a single moving part, the transducer. Frame rates vary from 0 to 30° and the sector angle from 0 to 60°. Abdominal applications include: differentiation of vascular structures, detection of small masses, imaging of diagonally oriented organs, survey scanning, and demonstration of regions difficult to image with contact scanners. Cardiac uses are also described.

3678. Speckle in ultrasound B-mode scans - Burckhardt C.B. - Cent. Res. Units, F. Hoffmann La Roche Comp. Ltd, Basel SWI - IEEE TRANS. SONICS ULTRASON. 1978 25/1 (1-6)

Ultrasound images obtained with a simple linear or sector scan show a granular appearance, called 'speckle'. This speckle is analyzed. The reduction in speckle that can be obtained with a compound scan with maximum amplitude writing is computed. The reduction in speckle is almost as large as can be obtained with averaging. It depends on the number of independent amplitude values that are measured. The condition, for the independence of 2 amplitude values is derived, and thus a limit is given for the possible reduction in speckle.

6. SPECIALIZED INSTRUMENTATION

3679. A new mechanical method for measuring rat paw edema - Petricevic M., Wanek K. and Denko C.W. - Scott Res. Lab., Fairview Gen. Hosp., Cleveland, Ohio USA - PHARMACOLOGY 1978 16/3 (153-158)

A new method is presented for measuring swelling or rat paw edema in inflammation induced by carrageenin injection. This technique is compared to other widely used ones. A spring-loaded dial indicator

produces results that are accurate, precise and reproducible. It is recommended for investigators seeking the advantages of a noninvasive, low cost, rapid method quantifying the swelling of inflammation.

3680. A continuous-running direct-reading sulphur dioxide recorder - Derrett C.J. and Brown C. - MRC Toxicol. Unit, Clin. Sect., St. Bartholomew's Hosp. Med. Coll., London EC1 6BQ GBR - J. PHYS. E. SCI. INSTRUM. 1978 11/4 (307-310)

An instrument for measuring sulphur dioxide in concentrations commonly encountered in the ambient air is described. It is based on the jet impinger system of Nash and incorporates several improvements. Recirculation of the reagent makes rapid measurement possible and electronic circuitry provides a voltage output directly proportional to SO₂ concentration and compensated for changes in reagent conductivity arising from variation of temperature. The new design of conductivity cell is more easily reproduced than that of Nash.

6.1. Metabolism

3681. Analytical determination of the energy expenditure of man from the parameter of external respiration - Gershkovich A.M. SUN - BIOPHYSICS 1977 22/4 (723-730)

A formula is derived relating the energy expenditure of man to the main functional indices of external respiration. For practical calculations correlations are proposed between the energy expenditure and the frequency and minute volume of respiration over the range of 7 to 100 l/min.

3682. Modeling the control of cell growth - Alberghina L. - Lab. Comp. Biochem., Inst. Physiol. Biochem., Univ. Milan, 20133 Milan ITA - SIMULATION 1978 31/2 (37-41)

Cell growth and proliferation are biological phenomena that have not yet been explained. This paper shows how models of the biochemical processes involved can be used both to interpret existing data and to design new experiments. A model is presented that divides the cell into 2 subsystems: one that synthesizes ribosomes and proteins and a second that performs DNA replication and cell division. Data obtained by simulation, as well as the analytical solution of the model equations, indicate that it is the activity of the first subsystem (the one whose state variables are ribosomes and proteins) and not that of the subsystem that limits the rate of cell proliferation.

6.2. Thermoregulation

3683. A new method for the transcutaneous measurement of deep body temperature during anesthesia and intensive care (Germ) - EIN NEUES VERFAHREN ZUR TRANSKUTANEN MESSUNG DER KÖRPERKERNTEMPERATUR IN ANÄSTHESIE UND INTENSIVPFLEGE - Just U., Hanf K., Koehler C.O. and Just O.H. - Anesthesiol. Abt., Chir. Zent., Univ. Heidelberg GFR - PRAKT.

ANAESTH. 1978 13/2 (144-149) - summ in ENGL

A new method for monitoring deep body temperature is described. It is based on the establishment, by means of electronic appliances, of a zone without heatflow from the deep tissues. The method is simple and the results compare favorably with those obtained by other procedures for measuring core temperature. The uses of this transcutaneous method are discussed and its advantages and reliability in the operating theatre and intensive care unit are emphasized. It becomes less reliable if it is employed during and after extracorporeal circulation in hypothermia on account of the temperature gradient.

6.3. Digestive tract

3684. A pneumatic reduction device for gastroschisis and omphalocele - Othersen H.B. Jr. and Hargest T.S. - Div. Ped. Surg., Med. Univ. South Carolina, Charleston, S.C. USA - SURG. GYNECOL. OBSTET. 1977 144/2 (243-248)

A new preformed pneumatic reduction device is available in two sizes, and it is recommended that a set be available for emergency use in any hospital which deals with the definitive emergency therapy of the newborn. The devices can be washed and flash sterilized as needed and, if properly cared for, can be reused repeatedly. The bag has facilitated the early care of newborns with omphalocele and gastroschisis and has allowed the rapid and effective reduction of eviscerated intestines. These bags can also be used for the controlled ventral hernias necessary in the treatment of infants born with large diaphragmatic hernias. It is hoped that the search for better techniques and materials will be continued, since the dramatic improvement in the survival rate of infants with gastroschisis and omphalocele has occurred not from a better understanding of the defects but by the application of improved techniques and materials in their treatment.

6.5. Blood

3685. Evaluation of biologic sources of variation of leukocyte counts and other hematologic quantities using very precise automated analyzers - Statland B.E., Winkel P., Harris S.C. et al. - Dept. Hosp. Lab., North Carolina Mem. Hosp., Chapel Hill, N.C. USA - AM. J. CLIN. PATHOL. 1978 69/1 (48-54)

The authors determined mean day-to-day (daily over five days), mean week to week (weekly over five weeks) and mean hour-to-hour (800 h, 1100 h, 1400 h) physiologic intra-individual variation of concentration values of leukocyte cell types, platelet count, and erythrocyte values (hematocrit, hemoglobin) for a group of 20 healthy adult volunteers. Total leukocyte counts and concentration values of leukocyte cell types were determined in duplicate on the Hemalog-D(TM) Automated Leukocyte Differential Cell Counter to minimize analytic variation. The data sets were analyzed according to an analysis of variance model. The mean physiologic hour-to-hour and week-to-week intra-individual variations in terms of % coefficient of variation included: hemoglobin, 2.5, 2.2; hematocrit,

2.6, 2.7; platelets, 1.6, 6.6; total leukocyte count, 9.4, 15.7; neutrophils, 12.9, 26.0; lymphocytes, 10.3, 13.2; monocytes, 18.6, 19.3; eosinophils, 19.9, 26.9; basophils, 7.4, 15.0; large unstained cells, 13.7, 16.0; 'high-peroxidase' cells, 32.7, 25.7. Hour-to-hour variation was partitioned into random diurnal variation, group-consistent diurnal variation, and subject-specific unique individual variation. Subject-specific diurnal variation contributed greatly and statistically significantly to total diurnal variation for many of the leukocyte cell types especially in the case of eosinophils, where it represented more than half of total diurnal variation.

3686. Laboratory experience with a new autotransfusion device - Welch J., Weintraub H., Gutterman B.J. et al. - Dept. Surg., Gen. Hosp., Rochester, N.Y. 14621 USA - ARCH. SURG. (CHICAGO) 1976 111/12 (1374-1378)

A new device for collecting and administering blood by intraoperative autotransfusion consists of several novel features: a collection bag that is kept expanded by a vacuum and into which the blood is drawn by suction of a lesser degree than the outside vacuum, a crease in the collection bag that decreases turbulence and foaming, and separation of the infusion element from the retrieval system by a valve that allows pressure infusion and suction continuously. The apparatus is inexpensive, quickly assembled, operated by wall suction or suction pump.

3687. A data processing system concerning laboratory results from donor blood samples - Rufener J.L. and Butler R. - Cent. Lab. Blood Trans. Serv., Berne SWI - REV. FR. TRANSFUS. IMMUNO-HEMATOL. 1978 21/2 (621-625) - summ in FREN

The aim of this system is to reduce the clerical work in the routine laboratory, as well as in the donor administration and to improve the safety of blood grouping.

3688. Comparison of the warming effect of three blood warmers (Germ) - VERGLEICHENDE UNTERSUCHUNG DER WARMELEISTUNG VON DREI BLUTWARMERN - Kroesen G. and Balogh D. - Inst. Anesthesiol., Univ. Innsbruck AUT - INFUSIONSTHER. KLIN. ERNAHR. 1978 5/2 (105-108) - summ in ENGL

The warming effect of two apparatuses using dry heat and of one apparatus with blood warming by microwaves is measured at the entry of the blood into the venous circulation. The following facts were compared: the time needed to prepare the apparatus, any occurring technical hazards, the relationship between blood temperature and blood flow, and finally the economy of the equipment. The results show alternative indications, on the one hand for the use of warmers with dry heat, on the other hand for those with microwaves. The low flows are of interest in the warming procedure of patients with hypothermia following trauma and the blood transfusion applied to infant anaesthesia.

6.7. Circulation

3689. Intraoperative doppler coronary artery finder - Moulder P.V., Teague M.J., Manuele V.J. et al. - Div. Thorac. Cardiovasc. Surg., VA Hosp., Gainesville, Fla. USA - ANN. THORAC. SURG. 1977 24/5 (430-432)

Time-consuming difficulty is occasionally encountered in finding coronary arteries or previously placed vascular grafts during coronary revascularization procedures. A catheter-tipped continuous-wave Doppler ultrasonic probe with simple audio output has been shown to be capable of expediting the search for these vessels.

3690. Radiofrequency-triggered pacemakers: Uses and limitations. A long-term study - Peters R.W., Shafston E., Frank S. et al. - Med. Surg. Serv., San Francisco Gen. Hosp. Med. Cent., San Francisco, Calif. USA - ANN. INTERN. MED. 1978 88/1 (17-22)

Seven patients with either recurrent paroxysmal supraventricular tachycardia (five), alternating bradycardia-tachycardia (one), or ventricular tachycardia (one) underwent insertion of permanent radiofrequency-triggered pacemakers. Follow-up evaluation (36 ± 24 months, mean $\pm$ SD) revealed that arrhythmias were well controlled in five of seven patients, although three of five required medication to decrease frequency of arrhythmias. Overdrive pacing was ineffective in one patient with Wolff-Parkinson-White syndrome who had recurrent bouts of atrial fibrillation or atrial flutter. One additional patient with ventricular tachycardia became refractory to overdrive atrial pacing. These studies document the long-term effectiveness of radiofrequency pacemakers in some patients with recurrent refractory arrhythmias. Careful patient selection and electrophysiologic studies are mandatory before implantation of a permanent radiofrequency pacemaker. Physicians must be aware of both the benefits and possible limitations of radiofrequency pacemakers in order to choose between pacemaker versus surgical intervention in patients with cardiac arrhythmias refractory to standard drug therapy.

3691. Impedance cardiography - Miller J.C. and Horvath S.M. - Hum. Factors Res. Incorp., Santa Barbara Res. Park, Goleta, Calif. USA - PSYCHOPHYSIOLOGY 1978 15/1 (80-91)

The purpose of this review was to integrate recent evidence supporting the reliability of thoracic impedance plethysmography as an estimator of cardiodynamic function. Reports regarding the development of the method for NASA, and numerous investigations comparing impedance cardiography to indicator dilution and other methods were discussed. It was concluded that impedance cardiography provides a reliable intra-subject estimation of relative changes in stroke volume and cardiac output. However, the reliability of the technique was found to depend greatly upon its use within a limited range of applications. Myocardial contractility and cardiopathology were also considered.

3692. Hydrostatic pressure and mammalian cardiac pacemaker function - Ornhaugen H.Ch. and Hogan P.M. - Dept. Physiol., Sch. Med., State Univ. New York,

Buffalo, N.Y. 14214 USA - UNDERSEA BIOMED. RES. 1977 4/4 (347-358)

The effects of hydrostatic pressure on pacemaker function were examined using sinus node preparations isolated from mouse, rat, guinea pig, rabbit, and dog hearts. In all species studied, an increase in hydrostatic pressure produced a reduction in beating frequency the magnitude of which varied directly with the magnitude of the intrinsic beating frequency of each species at 1 atm. Such slowing was evident over a wide temperature range (22.5 - 37°C) and persisted in the presence of atropine and propranolol. Adaptational changes were seen after long exposures to elevated pressure. For example, decompression after 2-3 hours at 150 atm resulted in beating frequencies faster than initial 1-atm control values. Additional evidence for the negative chronotropic action of pressure was provided by the finding that elevated pressure increased the suppression of spontaneous rate normally following periods of rapid stimulation, i.e., enhanced overdrive suppression. Microelectrode analysis of spontaneously beating Purkinje fibers revealed that the major cellular action of elevated pressure to cause slowing was a decrease in the rate of diastolic depolarization. It was concluded that hydrostatic pressure acting directly at the level of the pacemaker cell membrane represents an important factor modulating heart rate in diving man. However, other changes occurring simultaneously with pressure-induced bradycardia indicate that conduction disturbances may also develop under these conditions.

3693. Electrocardiographic mapping of the precordium in the coronary care unit - Madias J.E. and Hood W.B. Jr. - Cardiol. Dept., Boston City Hosp., Boston, Mass. 02118 USA - J. ELECTROCARDIOL. 1978 11/1 (97-100)

Precordial electrocardiographic mapping systems comprising a large number of recording sites have been utilized in the Coronary Care Unit for following natural course of ischemic injury and detecting extension of acute myocardial infarction in patients. These electrocardiographic techniques have also been found useful in evaluating the effects of a number of metabolic, hemodynamic and pharmacologic interventions currently proposed as effective means of reducing the extent of ischemic damage. However, these methods have not been found useful in the study of patients with inferior transmural or nontransmural myocardial infarctions. Bundle branch blocks and pericarditis complicating acute myocardial infarction invalidate the mapping technique. To assess effectiveness of therapeutic interventions, ST-segment changes taken as an index of ischemic injury are correlated with alterations of the QRS complex, used as a parameter of ischemic necrosis.

3694. Laser Doppler measurement of blood flow in the microcirculation - Powers E.W. III and Frayer W.W. - Dept. Surg., New York Hosp. Cornell Med. Cent., New York, N.Y. USA - PLAST. RECONSTR. SURG. 1978 61/2 (250-255)

In the experiments which have been described, a method for blood cell velocity determination, based on optical Doppler velocimetry, has been devised. It uses

glass fibers to produce a piece of apparatus which may be further refined to yield a convenient medical instrument. The goal of this experiment was to determine whether this method was capable of making reliable measurements of the Doppler shifting which results from red blood cell movement. The author believes this has been demonstrated. The measured frequency shifts coincided with the theoretical predictions. It was further shown that significant shifts in frequency can be measured, either from exposed blood vessels or from skin.

3695. A dye-dilution method for the determination of blood flow in Cimino-Brescia arteriovenous fistulae - Gothlin J., Lindstedt E. and Olin T. - Dept. Diagn. Radiol., Univ. Hosp., Lund SWE - INVEST. UROL. 1977 15/2 (167-168)

In 15 patients with large Cimino-Brescia fistulae, arm blood flow and cardiac output were determined by a dye-dilution technique. The mean blood flow through the arm with the shunt open was 1600 ml per min. On compression of the shunt the appearance time increased by 10 sec and there was a moderate decrease in cardiac output.

3696. Velocity distribution and blood flow measurements using videodensitometric methods - Kedem D., Kedem D., Smith C.W. et al. - Dept. Radiol., Vanderbilt Univ. Hosp., Nashville, Tenn. USA - INVEST. RADIOL. 1978 13/1 (46-56)

Digital cine-videodensitometry was employed for measuring blood velocity and blood flow in the descending aorta of human subjects. A very small, compact bolus of opaque dye was injected during different phases of the cardiac cycle, and flow through a portion of the aorta was analyzed. From the density vs time curves for different radial locations, the velocity distribution over the vessel cross-section was calculated. The velocity distribution obtained was nearly parabolic. Velocity and flow calculations were also made at different phases of the cardiac cycle.

3697. Strength-duration curves for trapezoidal waveforms of various tilts for transthoracic defibrillation in animals - Bourland J.D., Tacker W.A. Jr. and Geddes L.A. - Biomed. Engin. Cent., Purdue Univ., West Lafayette, Ind. 47907 USA - MED. INSTRUM. 1978 12/1 (38-41)

Transthoracic defibrillation threshold was measured in dogs and ponies using trapezoidal (i.e., truncated exponential decay) waveform shocks having durations of 2-20 msec and tilts of 15-90%. Electrodes 10 cm in diameter were used. Energy dose (J/kg) increased with increasing shock duration, but variation of tilt had little effect on the threshold energy required for defibrillation. The energy dose for the ponies was about three times that required for the dogs. The peak current per kilogram increased as duration was decreased or as tilt was increased. At any given duration and tilt, the peak current for dogs and ponies was similar. The peak current required for defibrillation rose rapidly when the pulse duration was less than 5 msec. The threshold charge increased almost linearly with increasing duration, the charge

being least for the shortest duration and highest tilt. These studies clarify the value of the two different electrical criteria upon which to determine a dose for defibrillation. The energy dose (joules per kilogram of body weight) is dependent on body weight, being higher in the larger animals. However, if the dose is expressed in terms of average current per kilogram of body weight, both the large and small subjects of both species have approximately the same ventricular defibrillation requirements. The average current dose, in amperes per kilogram of body weight, can be estimated by $I(AV) = 1/3 + 1/d$, that is, adding one-third to the reciprocal of the duration of the pulse, in milliseconds.

3698. Impedance to transthoracic direct current discharge: A model for testing interface material - Ewy G.A. and Taren D. - Sect. Cardiol., Dept. Int. Med., Univ. Arizona Coll. Med., Tucson, Ariz. USA - MED. INSTRUM. 1978 12/1 (47-48)

An in vitro method for screening the relative impedance of gels has been developed. A nonconductive chamber was built with 1-cm-diameter electrodes placed 1 cm apart. This chamber is filled with electrode gel to be tested. The defibrillator used delivers a half-sinusoidal waveform. When the same stored energy is discharged by this defibrillator into increasing impedance, the resultant delivered current wave decreases while the voltage wave increases. Thus, with increasing impedance, the delivered volt-time interval increases. Twelve electrode gels were studied; 10 measurements were made on each gel. There is a marked variation in the impedance to direct current discharge of commercially available electrode gels. A large number of commercially available electrode gels are not suitable for use as the interface between the paddle electrodes and the chest wall during elective cardioversion and emergency defibrillation.

3699. Chroma-memo-flow technique for rapid sequential analysis of regional cerebral blood flow (rCBF) responses - Overgaard J. - Neurosurg. Dept., Univ. Hosp., Odense C. DK-5000 DNK - CAN. J. NEUROL. SCI. 1978 5/1 (1-7) - summ in FREN

This is the first report of a method of sequential regional cerebral blood flow (rCBF) analysis, called Chroma-Memo-Flow. This technique is a computerized modification of the initial slope method of regional cerebral blood flow (rCBF init.), allowing temporal resolution of the flow pattern by calculation of the slopes of sequential segments of the initial 1-2 minutes of the Xenon-133 washout curve. The same theoretical analysis applies to this method as to the rCBF init. method. Each flow calculation is based on the slope of a discrete 16 second segment of the initial washout; and each second the segment is advanced by one second. A new flow calculation is made each second and is displayed as a color coded map on a TV screen. Each map is labelled, indicating the time in seconds following Xenon injection, and sequential rCBF changes during the clearance period can be immediately visualized. This allows for almost instantaneous analysis and display of rapid or transient rCBF responses to activation and

deactivation of the cerebral cortices. The data is stored in a 35 channel memory for deliberate replay, photography, and analysis. Functional tests may be applied during the initial washout period and both the magnitude and chronological relationships of the evoked regional cerebrovascular responses observed. A clinical study is presented to illustrate the possibilities of applying the technique to assess cortical reactivity.

3700. Non invasive method for measuring central venous pressure - Durr J.A., Vallotton M.B., Simon C.A. and Krahenbuhl B. - Div. Endocrinol., Dept. Med., Hop. Cant., Geneva SWI - LANCET 1978 1/8064 (586-587)

The only means of obtaining an accurate measurement of the central venous pressure (C.V.P.) has been by direct venous cannulation. The authors have extended the principle of Venous Stop-Flow Pressure (V.S.F.P.) in order to develop a non-invasive method of measuring C.V.P. The method consists of venous auscultation at the thoracic inlet with a Doppler device while the patient breathes out into a U-shaped manometer. The pressure at which venous flow ceases transiently is the venous stop-flow pressure. The authors have assumed that, in resting recumbent subjects, the normal thoracic venous flow is disrupted when intrathoracic pressure rises above the C.V.P.

3701. Distribution of the myocardial tissue PO_2 in the rat and the inhomogeneity of the coronary bed - Grunewald W.A. and Sowa W. - Physiol. Inst., Univ. D-8400 Regensburg GFR - PFLUG. ARCH. EUR. J. PHYSIOL. 1978 374/1 (57-66)

The structural inhomogeneity of the myocardial capillary bed is simulated by microcirculatory units (MCU's) in a diffusion model. This simulation is based on MCU's in which the arrangement of the capillary ends (concurrent structures, partial and total countercurrent structure, helical structure) as well as the structure and supply parameters are varied. The variation of these parameters is based on own measurements of the intracapillary HbO_2 saturation as well as on the following parameters from the literature: frequency distribution of capillary distance and capillary radius, mean capillary length or capillary section length respectively, arterial and mean venous PO_2 , mean coronary blood flow, mean O_2 consumption and diffusion conductivity. The analysis of O_2 supply of the normoxic rat heart shows that an O_2 diffusion shunt is obligatory except for MCU's with an extremely large capillary distance or with a concurrent capillary structure. Therefore the minimal tissue PO_2 lies at the level of the capillary venous PO_2 of a MCU. The maximum of the total PO_2 frequency distribution in the normoxic rat myocardium lies at 25 ± 5 mm Hg, i.e. above the mean venous PO_2 mm Hg). Tissue PO_2 values between 0 and 5 mm Hg amount to 0.5%, i.e. they are extremely rare. Tissue PO_2 values of 0-1 mm Hg represent less than 0.2%

3702. Group teaching of auscultation. Use of a new wireless stethoscope-type headphone - DeLeon A.C. Jr., Harvey W.P., Canfield D. and Johnson E. - Div. Cardiol., Dept. Med., Georgetown Univ. Sch. Med.,

Washington, D.C. 20007 USA - AM. J. CARDIOL. 1978 41/2 (333-335)

A new technique using infrared light for the transmission of heart sounds and murmurs is described. This method enables the simultaneous transmission of heart sounds and murmurs to large groups of persons without the need for hard-wire connections to the amplifying device. The method facilitates teaching of cardiac auscultation at the bedside as well as in the setting of conferences, seminars or postgraduate education programs.

3703. Method for measuring blood flow and volumes using indicator dilution techniques in patients with transposition of the great vessels - Brooks J., Norwich K.H. and Zelin S. - Dept. Physiol., Univ. Toronto CAN - MED. BIOL. ENG. COMPUT. 1978 16/2 (155-160) - summ in GERM, FREN

A new indicator-dilution technique is proposed for the measurement of pulmonary blood flow in patients with complete transposition of the great arteries and a defect in either the atrial or ventricular septum. The proposed method involves analysis of three indicator-dilution curves which have been prepared sequentially as follows: injecting in the vena cava and sampling in the pulmonary artery, injecting in the vena cava and sampling in the aorta, and (usually) injecting in the right ventricle and sampling in the aorta. In addition to the calculation of pulmonary blood flow, this method permits concurrent calculation of systemic blood flow, effective pulmonary blood flow (net flow through the septal defect from lesser to greater circulation), and pulmonary blood volume. A quantitative measure of the physiological effectiveness of the septal defect is suggested. The theory was tested using a hydrodynamic model which simulated transposition. The model employed two Harvard pulsatile blood pumps, a plastic chamber ('heart') containing a defective septum, and an optical-fibre probe for measuring indicator concentration in situ. The proposed technique was found to give accurate values for flows and volumes. The 'physiological' effectiveness of the septal defect was observed to be dependent only on the area of the defect.

3704. Device for the automatic control of surgical aspiration in cardiac surgery - DISPOSITIF DE CONTROLE AUTOMATIQUE DES ASPIRATIONS CHIRURGICALES EN CHIRURGIE CARDIAQUE - Barthelemy R., Vives M., Couzy H. et al. - Serv. Chir. Cardio Vasc., Hop. Rangueil, Toulouse FRA - MED. BIOL. ENG. COMPUT. 1978 16/2 (165-168) - summ in FREN, GERM

An attempt has been made by the authors to automate the aspiration of blood in cardiac surgery under extra-corporal circulation. The presence of blood at the end of tubing can be detected by means of a system based upon the blood's property of conductivity. The motor of the aspiration pump is halted when there is no blood. The motor is triggered when blood appears. Another detector has been designed to prevent the suction effect when the extremity of the tube is applied against a wall. This

suction is accompanied by depression inside the tube which persists even if the pump is stopped. This depression is picked up by a vacuumeter. An electronic system detects a limit level of negative pressure and stops the pump motor. To oppose the persistence of this suction blood arrives through a calibrated aperture at the level of the aspiration tubing from a reservoir in which there is atmospheric pressure; this enables the cannula to detach itself from the tissue. The pump will start again when the pressure in the tube is equal to atmospheric pressure and if there is blood at the end of the cannula. These two detectors have been linked in such a way as to form an automatic aspiration unit.

3705. The inherent mathematical error factors in the radiological determination of heart volume - Sperber G.O. - Dept. Physiol. Med. Biophys., Uppsala SWE - UPSALA J. MED. SCI. 1978 83/2 (89-95)

When heart volume is calculated from two X-ray projections, part of the error is due to the fact that the formulas employed are not mathematically exact. This error was calculated for a variety of shapes and positions of the heart. The results indicate that this error may reach about 30% for hearts of fairly ordinary shape. When the standard projections are used, horizontally positioned hearts are particularly liable to give rise to large errors of this kind.

3706. Use of a programmable calculation in cardiopulmonary perfusion - Mills J.D. and Tallent J.H. - Cardiopulmon. Perfusion, Cardiovascular Thorac. Surg. Ass., Chattanooga, Tenn. USA - CARDIOVASC. DIS 1978 5/2 (156-166)

This study describes a hand-held, battery-powered, programmable instrument that can be taken directly into the operating room by cardiopulmonary perfusionists. Three programs are described in detail: cardiopulmonary perfusion parameters and estimated blood volume; blood gas parameters and saturations, with temperature corrections; and cardiopulmonary oxygen transfer and oxygenator efficiency. This inexpensive calculator allows perfusion personnel to manipulate easily-derived data into values which heretofore have required elaborate nomograms or special slide rules, or were not available within a reasonable computational time.

3707. A localizing device for X-ray sources - Benink R.J. - Dept. Anat. Embryol., Univ. Leiden NLD - RADIOLOGY 1978 128/2 (508-509)

The author describes a localizing device which permits accurate placement of X-ray sources in relation to both the patient and the cassette. Radiographs can be reproduced exactly using this device.

3708. Topoflow: A digital full range Doppler velocity meter - Brandestini M. - Div. Ultrasound, Cent. Bioengin., Univ. Washington, Seattle, Wash. USA - IEEE TRANS. SONICS ULTRASON. 1978 25/5 (287-293)

A digital implementation of the multigate Doppler blood flowmeter is described. The observation range of 10 cm is divided into 128 depth channels, thus offering

the unique possibility of simultaneously recording the blood vessel geometry as well as the blood flow topography, where topography is defined as a two-dimensional map of blood flow velocity along the axis of a blood vessel. The apparatus consists of 3 major sections: transmitter/receiver and mixer which produce a range phase signal containing the velocity information; the range phase signal is sampled, digitized, and stored into 128 memory cells for further processing. A feedback circuit significantly reduces the required resolution of the analog to digital converter and at the same time suppresses unwanted low-frequency signals; a frequency discriminator yields a voltage proportional to the velocity in each channel. The system can detect 50 velocity profiles per second, sufficient to characterize the pulsatile flow in arteries. The main features of the novel instrument are minimal hardware due to sequential signal processing, ease of operation, and a variety of display modes, including two-dimensional flow maps. The results, obtained in laboratory tests under simulated conditions as well as in transcutaneous applications, agree well with those reported by other investigators using conventional equipment.

6.8. Respiration

3709. New PEEP device; application of PEEP and CPAP during manually operated ventilation. (Germ) - EIN NEUES PEEP VENTIL. MOGLICHKEITEN DER ANWENDUNG VON PEEP UND CPAP BEI HANDBEATMUNGSGERATEN - Dick W., Milewski P. and Traub E. - Dept. Anesthesiol., Zent. Interdisziplin. Med. Einheiten, Univ. Ulm GFR - ANAESTHESIST (BERL.) 1977 - summ in ENGL

A new PEEP device has been developed for use with manually operated resuscitators. The PEEP valve can be combined with adult resuscitators as well as with neonatal resuscitators (40 g). The PEEP can be varied between 0 and +10 cm H₂O. With this new PEEP device it is now possible to apply PEEP during manually operated artificial ventilation, e.g. during transportation etc.

3710. Use of a new simple device, the airflowmeter, in detecting changes in airways obstruction - Poppius H. and Mattson K. - Dept. Pulmon. Dis., Univ. Cent. Hosp., Helsinki FIN - SCAND. J. RESPIR. DIS. 1977 58/5 (269-272)

A simple device for measuring ventilatory function, the airflowmeter, was found to be at least as sensitive as the Wright peak-flow meter in detecting histamine-induced bronchoconstriction in asthmatic patients. The apparatus also was found suitable for monitoring ventilatory function by the patients themselves at home.

3711. Theoretical modeling of fine-particle deposition in 3-dimensional bronchial bifurcations - Shaw D.T., Rajendran N. and Liao N.S. - Lab. Power and Environm. Studies, Fac. Engin. Appl. Sci., State Univ. New York, Buffalo, N.Y. USA - AM. IND. HYG. ASSOC. J. 1978 39/3 (195-201)

A theoretical model is developed for the prediction

of the peak to average particle deposition flux in the human bronchial airways. The model involves the determination of the peak flux by a round-nose 2-dimensional bifurcation channel and the average deposition flux by a curved-tube model. The 'hot-spot' effect for all generations in the human respiratory system is estimated. It is found that the peak deposition flux is higher than the average deposition flux by a factor ranging between 5 and 30, depending on the generation number. The importance of this peak to average deposition flux ratio on consideration of environmental safety studies is discussed.

3712. Thoracic impedance of human subjects - Machin J.W. - Dept. Elect. Electr. Engin., North Staffordshire Polytechnic, Stoke on Trent GBR - MED. BIOL. ENG. COMPUT. 1978 16/2 (169-178) - summ in FREN, GERM

A means for the measurement of the thoracic impedance of human subjects is described, and some account is given of its application under conditions of emergency in a hospital. The results obtained are presented in various ways, and some inferences are drawn regarding the inter-relation of the various parameters and quantities involved.

3713. A comparison of the Jones and Stead-Wells spirometers - Glindmeyer H.W.III, Anderson S.T., Diem J.E. and Weill H. - Pulmon. Dis. Sect., Dept. Med., Tulane Univ., Sch. Med., New Orleans, La. 70112 USA - CHEST 1978 73/5 (596-602)

A comparison was made between the noncounterweighted Jones and Stead-Wells spirometers, and 'conversion factors' were determined for the forced expiratory volume in one second (FEV₁) and the forced vital capacity (FVC). A cross-sectional study produced a high correlation between the instruments for these two measurements, yielding quadratic and linear regression equations ('conversion factors') for FEV₁ and FVC, respectively. Standard deviations of measurements were similar for both spirometers. Results from a longitudinal study agreed with the 'conversion factors' predicted from the cross-sectional study; however, significant day-to-day variability was observed by both spirometers. Neither spirometer met all of the technical recommendations proposed by the Committees on Environmental Health and Respiratory Physiology of the American College of Chest Physicians; however, the Stead-Wells water-sealed spirometer complied more often than the Jones waterless spirometer (Pulmonor). In addition, the open-circuit procedure used for the Jones spirometer required more coordination in the subject than did the closed-circuit procedure employed in this study for the Stead-Wells spirometer; however, with application of the 'conversion factors', both instruments, yield comparable data and prove adequate for spirometric studies.

3714. Internal EM field and absorbed power density in human torsos induced by 1-500-MHz EM waves - Kun-Mu Chem and Bhag S. Guru - Dept. Elect. Engin. Syst. Sci., Michigan State Univ., East Lansing, Mich. 48824 USA - IEEE TRANS. MICROWAVE THEORY

TECH. 1977 25/9 (746-756)

Numerical results on the internal electromagnetic (EM) field and absorbed power density inside a human torso induced by EM waves of frequencies ranging from 1 to 500 MHz and of both vertical and horizontal polarizations are presented. The induced fields inside the torso are shown to be dependent on the frequency and the torso geometry. Theoretical results are obtained based on the tensor integral equation method, and some theoretical predictions are compared to existing experimental results.

3715. Overview of electrostatic devices for control of submicrometer particles - Melcher J.R., Sachar K.S. and Warren E.P. - Dept. Electr. Engin., Massachusetts Inst. Technol., Cambridge, Mass. 02139 USA - PROC. IEEE 1977 65/12 (1659-1669)

The electrostatic precipitator (ESP) is the most widely used of a family of air pollution control devices that primarily exploit electrical forces in the control of particulate emissions. Others are the space-charge precipitator (SCP) (where the electric precipitation field is generated by the particles being collected), the self-agglomerator (SAG) (where oppositely charged particles are induced to agglomerate by the mutual force of attraction), the charged-droplet scrubber (CDS-I) (where drops charged to one polarity collect pollutant particles charged to the opposite polarity), charged-droplet scrubber (CDS-II) (where bipolar drops collect oppositely-charged fine pollutant particles), and charged-drop precipitators (CDP) (where fields generated by charged drops are used to precipitate like-charged fine particles onto electrodes). Using gas-residence time for effective cleaning as a dominant criterion, a broad overview of the relative merits of each of these systems in the control of submicrometer particles is given. Experiments illustrate the SCP and SAG modes. The CDS and CDP configurations are modeled and tested in experiments designed to isolate the relevant collection processes. The characteristic-time approach to interrelating diverse systems identifies the electrofluidized bed (EFB) as yet another configuration, one that is especially attractive for obtaining high efficiency with extremely short residence times.

6.9. Reproductive system

3716. The starfish (Patiria and Pisaster) oocyte: A model system for the study of hormone-surface interaction in oogenesis - Lee H.H., Rosenberg M.P. and Hoesch R. - Dept. Biol., Univ. Toledo, Ohio USA - LAB. ANIM. SCI. 1977 27/5II (860-865)

Studies were made to determine if the starfish (Patiria and Pisaster) oocyte could serve as a model system for investigations of hormone-surface interactions in eucaryotic cells. Treatment of starfish oocytes with maturation inducing hormone, 1-methyladenine, was observed by scanning electron microscopy to induce surface alteration. The action of the hormone was dependent on the presence of the cation Ca⁺⁺. Although caffeine, theophylline, and theobromine supposedly inhibit maturation of oocytes, studies using the starfish oocyte showed that

theobromine does not inhibit maturation and the inhibition caused by caffeine and theophylline is reversible. Other studies using the starfish oocyte and tritiated l-methyladenine showed that the hormone does not dissociate from the oocyte once bound, and that the oocyte surface may have multiple receptors for l-methyladenine. From these studies it was concluded that the starfish oocyte is a useful model for studies of hormone-surface interactions in eucaryotic cells.

3717. A new experimental procedure of intraamniotic application of substances in multiparous experimental animals (Germ) - EXPERIMENTELLES MODELL ZUR INTRAAMNIOTEN ANWENDUNG VON SUBSTANZEN BEI MULTIPAREN

VERSUCHSTIEREN - Endell W., Grosspietzsch R., Klink F. et al. - Abt. Gynakol. Geburtsh. II, Med. Hochsch., Lubeck GFR - RES. EXP. MED. 1978 172/2 (155-159) - summ in ENGL

In order to prove the distribution and metabolizing of various substances experimental operation models in animals were developed. The placental transfer was examined in guinea pigs and rabbits, while metabolism was studied in the Gottinger miniature pig. The presented model enables us to examine the maternal organism, placenta, amniotic fluid and fetus.

6.10. Urinary tract

3718. A laboratory evaluation of a new hydraulic incontinence device - Merrill D.C. and Teague C.T. - Dept. Urol., VA Hosp., Martinez, Calif. USA - J. UROL. 1978 119/1 (108-112)

A hydraulic incontinence device is described. The device is physiologic because it can be deflated to allow resistance-free voiding and it is designed to respond instantaneously to fluctuations in intra-abdominal pressure, irrespective of whether the bulb is placed at the level of the bulbous urethra or the bladder neck. The device is simple, consisting only of a urethral cuff, an abdominal reservoir and 1 pump containing a single valve.

3719. Development of a carbon dioxide laser cystoscope - Willscher M.K., Filoso A.M., Jako G.J. and Olsson C.A. - Urol. Res. Lab., Boston VA Hosp., Boston, Mass. USA - J. UROL. 1978 119/2 (202-207)

A 50-watt carbon dioxide continuous laser coupled to a Zeiss surgical microscope was used to study the characteristics of laser-induced lesions on the exteriorized canine bladder. The relationship of energy to the depth of the lesion created by the laser was evaluated. Healing, vertical temperature transmission and hemostasis were studied. A prototype carbon dioxide laser cystoscope then was constructed and used endoscopically to create surgical lesions in the intact canine bladder.

3720. Progress in hemodialyzers and membranes: The last 20 years - Klein E. - Gulf South Res. Inst., New Orleans, La. USA - CLIN. NEPHROL. 1978 9/4 (131-137)

The development of clinical dialyzers is traced over the past three decades. Beginning with the Kolff

rotating device, the evolution of dialyzers has followed a path to reduce size, increase metabolite transport, and minimize blood losses. A combination of design innovations and membrane developments has been necessary to achieve the performance of current dialyzers. These include the development of thin-channel plate dialyzers hollow-fiber membranes, and more permeable membranes. The development of better devices has been hindered by lack of complete understanding of physiological and biochemical needs for treatment of end stage renal patients. A backlog of engineering and materials information is available for future utilization when therapy needs are clarified. Future trends in membrane developments may include melt-extrudable and 'non-isotropic' membranes.

6.11. Nervous system

3721. Application of a solid membrane ion-selective electrode to in vivo measurements - Crowe W.,

Mayevsky A. and Mela L. - Harrison Dept. Surg. Res., Univ. Pennsylvania Sch. Med., Philadelphia, Pa. 19174 USA - AM. J. PHYSIOL. 1977 233/1 (C56-C60)

A solid membrane electrode containing a highly selective ion-complexing agent immobilized in a polymer membrane is applied to measurements in vivo from the surface of an organ. For the measurements reported here, an ion-complexing agent selective for potassium is incorporated in a silicone rubber membrane and applied to measure ion changes in the brain. Comparison is made to the measurements recorded with an ion-selective microelectrode in the cortical tissue. The surface electrode compares favorably with the microelectrode in terms of amplitude of response and response time for the changes Leao. The methods reported here are amenable to a selection of ion measurements by incorporation of a suitable ion exchanger in a polymer membrane. Extracellular ion activity is monitored in the anesthetized animal by holding the electrode in a balanced suspension which provides a light, flexible contact to the organ of interest. In the unanesthetized animal, when recording from the brain, the electrode is fixed in a skull-implanted cannula.

3722. Visual field differences in a facial recognition task using signal detection theory - Finlay D.C. and French J. - Dept. Psychol., Univ. Newcastle AUS - NEUROPSYCHOLOGIA 1978 16/1 (103-107) - summ in GERM

A signal detection theory model was used to ascertain whether reported differences in facial recognition was due to particular characteristics of the two hemifaces or was due to the visual field to which the hemiface was presented. The results indicated that the right hemisphere was more efficient in handling facial information than the left and that facial characteristics as presented in photographic form were not important.

3723. First experience with closed-circuit television at a psychiatric hospital (Czech) - Zapletal M. - Psychiat. Klin. Lek. Fak. KU Hradec Kralove CSK - CESK. PSYCHIATR. 1977 73/6 (383-386) - summ in ENGL,

The author presents a report on his first batch of experience with the uses of closed-circuit television as employed at the Department of Psychiatry, Hradec Kralove. The opportunities offered by closed-circuit television are seen as a substantial contribution particularly in intensive-care units and wards with its possibilities of round-the-clock observation of the patients. Another line of exploitation involves the teaching of medicine and, last but not least, closed-circuit television linked up with video-tape-recording makes it possible to add more quality to the process of teaching.

3724. Delayed visual evoked potentials with bilateral disease of the posterior visual pathway - Ashworth B., Maloney A.F.J. and Townsend H.R.A. - Dept. Med. Neurol., Edinburgh North. Dist., Edinburgh GBR - J. NEUROL. NEUROSURG. PSYCHIATRY 1978 41/5 (449-451)

A man of 51 years presented with sudden onset of a confusional state and marked visual deterioration. The computerised transaxial tomogram showed a mass in the corpus callosum which had spread to involve both cerebral hemispheres. The visual evoked potential to pattern stimulus was delayed by about 20 ms. Necropsy confirmed the presence of an astrocytoma of the corpus callosum involving the optic radiation and occipital cortex on both sides. The anterior visual pathway was normal.

3725. Simple apparatus for generating reaction time histograms - Celebi G.A. - Ege Univ. Sch. Med., Dept. Physiol., Bornova, Izmir TUR - PHYSIOL. BEHAV. 1978 20/3 (355-356)

Human reaction times (RT) to sensory stimuli show variations that cannot be explained by peripheral or central neural processes. The statistical distribution of RT's for a given stimulus and differences in RT distributions for different stimuli seem to have received little attention. This report describes a simple apparatus for generating RT histograms while a subject responds to various stimuli. The system has been found useful not only for the on-line generation of RT histograms with light and sound stimuli but also for studying simultaneously the time course of cortical potentials evoked by these stimuli.

3726. Videotape technology in the identification and storage of intracerebral electrode locations - Thomson J.H., Beeman F.J., Conger G.L. et al. - Dept. Psychol., Cent. Washington Univ., Ellensburg, Wash. 98926 USA - PHYSIOL. BEHAV. 1978 20/4 (487-489)

Using standard videotape recording (VTR) equipment and a modified optical system, it is possible to identify and record the location of surgically implanted electrodes with picture and sound. No special chemicals or darkroom procedures are required.

3727. A new method for the estimation of average evoked responses - Kaveh M., Bruzzone S. and Torres F. - Dept. Electr. Engin., Univ. Minnesota, Minneapolis, Minn. 55455 USA - IEEE TRANS. SYST. MAN CYBERN. 1978 8/5 (414-417)

A method is introduced for estimating unknown signals corrupted by a noise that can be modeled by an autoregressive (AR) process. The filter, referred to as the predictor-subtractor-restorer (PSR) filter is used to estimate average visual evoked responses that are corrupted by the background EEG. It is demonstrated that this filter offers superior performance to previously reported Wiener filters that have been used in this application.

6.12. Receptors

3728. Implanted auditory prosthesis: an evaluation of subjects presently fitted with cochlear implants - Bilger R.C., Black F.O., Hopkinson N.T. et al. - Dept. Otolaryngol., Eye and Ear Hosp., Pittsburgh, Pa. USA - TRANS. AM. ACAD. OPHTHALMOL. OTOLARYNGOL. 1977 84/4I (677-682)

Independent evaluation of the subjects presently fitted with implanted auditory prostheses was carried out. Thirteen people throughout the United States, who had functioning cochlear prostheses, were flown from their homes to the Eye and Ear Hospital where they spent one week receiving medical, audiologic, vestibular, psychoacoustic, and psychologic evaluation. With their prostheses activated, these subjects were aware of sounds throughout the range of frequencies tested (125 to 8,000 Hz) at intensity levels that could be presumed to occur in a typical sound environment. Although they could not understand speech with their prostheses, the subjects did score significantly higher on tests of lipreading and recognition of environmental sounds with their prostheses activated than without. In addition, their speech was rated as more intelligible when their prostheses were activated than when they were off.

3729. Side branch and parallel vent effects in real ears in in acoustical and electrical models - Studebaker G.A. and Cox R.M. - Dept. Speech Hearing Sci., City Univ. New York Grad. Cent., New York, N.Y. 10036 USA - J. AM. AUDIOL. SOC. 1977 3/2 (108-117)

The purpose of the project was to demonstrate and explain the acoustic effects of side branch and parallel vents in individual real ears. It was shown that parallel and side branch vents produce similar low frequency filtering effects and vent-associated reactance resonances. However, when the input system incorporates a side branch vent the sound pressure produced in the ear canal at frequencies above the vent-associated resonance is less than that produced when the input system is unvented. This effect is not seen when the input system is associated with a parallel vent. Data obtained in the real ear canals were compared to analogous measurements made using an acoustical model (the Zwislocki coupler) and an electrical model designed to simulate the hearing aid receiver, input tubing, earmold, ear canal, and eardrum. Both models yielded data very similar to the real ear results. The advantages of each model in predicting the effects of individual earmold vents are discussed.

3730. Calibration force levels for bone conduction

vibrators - Billings B.L. and Winter M. - *Audiol. Cent., Redlands, Calif. USA - J. SPEECH HEAR. RES.* 1977 20/4 (653-660)

Two bone conduction vibrators (Radioear B71 and B72) and a headband (Radioear P-333) have been developed to meet specifications of both the International Electrotechnical Commission and the American National Standards Institute. Pure-tone thresholds for air conduction and bone conduction were obtained from 24 normal-hearing young adults at audiometric frequencies between 250 and 4000 Hz. Results of this study are in good agreement with the standard air conduction threshold sound pressure levels (ANSI) and with bone conduction threshold force levels reported in the literature.

3731. A comparison of four hearing aid measurement systems - Townsend T.H. and Schwartz D.M. - *Cent. Michigan Univ., Mt. Pleasant, Mich. USA - J. SPEECH HEAR. RES.* 1977 20/4 (718-730)

Measurements of hearing aid performance were made using four different electroacoustic systems. Nine hearing aids were evaluated three times in each of the four systems: a standard Bruel and Kjaer apparatus, a Fonix 5000, and both a Phonic Ear HC 1000 and HC 2000. Tests included frequency response and, when possible, total harmonic distortion, second harmonic distortion, and third harmonic distortion. Results were equivalent for frequency response and second harmonic distortion, whereas significant differences occurred for total harmonic distortion and third harmonic distortion at both the low and high frequencies. The degree to which the sum of second harmonic distortion and third harmonic distortion fails to equal the total harmonic distortion was also examined. In the low frequency region, second harmonic distortion plus third harmonic distortion yielded values considerably less than the total harmonic distortion, although good agreement was found in the midfrequencies.

3732. An electronic apparatus to measure the retinal neural fading phenomena - Albee J.L., Albee P.R. and Young F.A. - *Washington State Univ., Pullman, Wash. USA - PERCEPT. MOT. SKILLS* 1977 45/3 II (1091-1096)

Fading and regeneration of visual stimuli is a phenomenon which occurs under the condition of redundant visual stimulation in the human eye. By totally encompassing a subject's visual field with large sheets of colored cardboard, which provided an undifferentiated ground, it was found that the color spontaneously disappeared and reappeared. This evidence suggested that the cycle is a fundamental aspect of the visual process. The Retinal-Neural Fading Phenomena Device was developed using light-emitting diodes (LED) as the stimulus source. This allowed the quantitative measurement of the rate of fade and degree of satiation the eye undergoes under a redundant presentation equivalent to stabilized images. The rate and degree of satiation to redundant stimulation appears to correlate highly with a subject's reading efficiency. The data suggested that rapid and deep satiation was the favored outcome if one is to be

free from reading or perceptual disorders. This leads to the speculation that rapid fade of afterimages of previously read symbols is required to prepare the visual system for new material. Conversely, the inability to suppress afterimages may be a physiological factor in the 'dyslexic' syndrome.

3733. Stereoscopic comparator. With primary use for optic discs - Donaldson D.D. and Grant W.M. - *Howe Lab. Ophthalmol., Massachusetts Eye Ear Infirmary, Boston, Mass. USA - ARCH. OPHTHALMOL. (CHICAGO)* 1978 96/3 (503-504)

A new device makes it much easier and more satisfactory to compare different sets of stereophotographs of an optic disc than is possible with ordinary stereo viewers that accept only one stereopair at a time. Two ordinary stereophotographic transparencies of the optic disc are inserted and viewed simultaneously through a single pair of eyepieces. By means of a pair of mirrors in the device, the two stereophotographs are made to appear close to one another so that with very small eye movements one can look from one to the other and make a very satisfactory comparison. It is desirable that the sensitivity for detection of glaucomatous change in the optic disc by this simple means be compared with the results of more complex and costly methods of analysis of the optic cup.

3734. Objective perimetry by evoked potential recording: Limitations - Regan D. and Milner B.A. - *Dept. Communicat., Univ. Keele GBR - ELECTROENCEPHALOGR. CLIN. NEUROPHYSIOL.* 1978 44/3 (393-397) - summ in FREN

Several authors have attempted to use evoked potential recording as a means of objective perimetry. This note describes two limitations. These are: The topological distribution of both flicker and pattern EPs over the scalp depends on which retinal site is stimulated. Thus, in normal subjects, EPs can erroneously suggest that one part of the visual field is defective at electrode A while erroneously suggesting at electrode B that a different part of the visual field is defective. Plots of EP amplitude vs. flicker frequency are different for different retinal quadrants. Thus, in normal subjects, flicker EPs can erroneously suggest a field defect in quadrant A at one flicker frequency while erroneously suggesting a field defect in quadrant B at a different flicker frequency. Further complications are that flicker EPs for individual quadrants can differ markedly between subjects and between left and right eyes of individual subjects (though these differences seem less for full-field stimulation). These two points limit EP perimetry in the sense that quite misleading conclusions can be drawn from either transient or flicker EPs from a single electrode or flicker EPs at a single flicker frequency. It is necessary at least to compare records from several electrode sites and at several flicker frequencies; in itself a laborious procedure unless a computer is used. Even then, the development of an appropriate computer programme would not be trivial work, because the appropriate criteria for abnormality

remain to be empirically established by recording from an adequately large population of control subjects.

3735. A quantitative comparison of the time course of sensitivity changes produced by calcium injection and light adaptation in Limulus ventral photoreceptors - Fein A. and Charlton J.S. - Lab. Sensory Physiol., Mar. Biol. Lab., Woods Hole, Mass. 02543 USA - BIOPHYS. J. 1978 22/1 (105-113)

The time-course of light and dark adaptation was quantitatively compared with the time-course of the onset of and recovery from desensitization produced by intracellular calcium injection in Limulus ventral photoreceptors. The onset of light adaptation tended to be faster (by 60-90 s) than the onset of desensitization produced by intracellular Ca^{++} injection. The initial portion of the time-course of dark adaptation was faster (about 10-20s) than the time-course of recovery from desensitization produced by intracellular Ca^{++} injection. The final portion of recovery from Ca^{++} injection had the same time-course as a comparable dark adaptation.

3736. Analysis of the spatial-frequency characteristics of complex receptive fields - Kuperman A.M. - Pavlov Inst. Physiol., USSR Acad. Scis, Leningrad SUN - BIOPHYSICS 1977 22/1 (118-124)

For the receptive field with several zones of excitation and inhibition the width of the bandpass of the spatial frequency characteristic and the relation of its boundary frequencies are determined by the size of the field and the structure of its zones of excitation and inhibition and do not depend on the form of the weight functions of the zones of excitation (inhibition). Theoretical evaluations are found of the ratio of the boundary frequencies and size of the receptive field close to the results of measurement of these values in psychophysical and electrophysiological experiments. Fall in the contrast sensitivity with rise in frequency may be explained by the dependence on the spatial frequency of the envelope of the weight functions of the zones of excitation (inhibition) of the receptive fields.

3737. Experiments with automatic input of handwritten numerical data into a large administrative system - Spanjersberg A.A. - Dr. Neher Lab., Netherlands Postal Telecommun. Serv., Leidschendam NLD - IEEE TRANS. SYST. MAN CYBERN. 1978 8/4 (286-288)

A description is provided of data entry requirements for the Netherlands Postal Giro Service and of early investigations into alternative encoding techniques. Based largely on human factors considerations, automatic handprint recognition was selected for use. Both the prototype system implemented, and operational experience to date, are described.

3738. Some real world experiences with handprinted optical character recognition - Himmel D.P. - Recognit. Equipm. Incorp., Dallas, Tex. 75222 USA - IEEE TRANS. SYST. MAN CYBERN. 1978 8/4 (288-292)

Several case experiences concerning OCR reading of handprinted data are discussed, including working installations for reading controlled numeric handprint

and experimental reading of controlled alphanumeric handprint and uncontrolled numeric handprint. The effect on machine performance of training people to form characters correctly is discussed along with other operational and human factors. It is concluded that successful training of large numbers of people for both numeric and alphanumeric handprint is possible and that the length of training sessions need be no more than ten one hour sessions. It is also concluded that the method of handling rejected documents for correction or for training feedback is important to achieving a successful installation for reasons of both performance and human acceptance.

3739. Human factors of constrained handprint for OCR - Apsey R.S. - IBM Syst. Communicat. Div., Endicott, N.Y. USA - IEEE TRANS. SYST. MAN CYBERN. 1978 8/4 (292-296)

The results of a controlled study of the handprinting of numeric and alphanumeric characters for input to Optical Character Readers (OCR) are described. The purpose of the study was to evaluate the ability of people to handprint various constrained fonts using different preprinted guidance schemes and to compare their performance to unconstricted handprinting.

6.13. Locomotor apparatus

3740. Biomechanical considerations on stress and strain of the anchorage of femoral prostheses stems (Germ) - BIOMECHANISCHE BETRACHTUNGEN ZUR BEANSPRUCHUNG DER VERANKERUNG VON FEMURSCHAFTPROTHESEN - Hinterberger J. and Ungethüm M. - Orthop. Klin., Univ. München GFR - Z. ORTHOP. IHRE GRENZGEB. 1977 115/6 (936-941) - summ in ENGL

The nature of load and stress on implanted femoral prostheses is shown by simplified models. Bending stress is responsible for loosening and fracture of prosthesis stems. Implantation in valgus position diminishes the possibility of failure. Investigations on materials and the strength of form could clear up different influences and shall lead to allbountiful criterions and test-methods.

3741. Osteosynthesis for infected femoral pseudarthroses using the interlocking nail. 31 Case reports (Germ) - OSTEOSYNTHESE INFIZIERTER FEMURPSEUDARTHROSEN MIT DEM VERRIEGELUNGSNAGEL. BERICHT UBER 31 FÄLLE - Goetz J., Klemm K. and Schellmann W.D. - Berufsgenossenschaftl. Unfallklin., Frankfurt/M. GFR - ARCH. ORTHOP. UNFALL-CHIR. 1977 90/3 (275-284) - summ in ENGL

31 cases of infected pseudarthrosis of the femur were re-osteosynthesized with the interlocking nail. Bony consolidation was obtained in 26 patients, in all cases the chronic osteomyelitic infection subsided with removal of the nail. Pseudarthrosis persisted in 3 cases, after removal of the nail the patients could walk with a walking splint. In one of this group bony consolidation was obtained after repeated interlocking nailing. Persisting pseudarthrosis and infection was the indication for amputation in 2 cases.

3742. Foot movement plate for long term treatment with external supports at the tibia - Petracic B. and Weichmann P. - Ev. Nurs. Home St. Martin, Koblenz GFR - UNFALLCHIRURGIE 1977 3/2 (141-142) - summ in GERM, FREN

There can often be a restriction of mobility in the upper ankle-joint with a pes equinus position in pre-treated patients suffering from fragmentary tibia fractures, Osteomyelitis or incorrect joint formation. In further treatment the external support is then an essential for these patients. To improve the correction of the pes equinus position as well as to increase the improved mobility in the upper ankle-joint through fixed external supports, a foot movement plate was developed which allowed a gradual correction of the faulty position of the foot as well as movement in the upper ankle-joint.

3743. Personal experience with extrafocal compression-distraction osteosynthesis using the Ilizarov apparatus (Bulg) - Katzarov H., Sokolov T., Andreeff I. and Genov S. - Inst. Ortop. Travmatol., Med. Akad., Sofia BUL - ORTOP. TRAVMATOL. (SOFIA) 1977 14/3 (166-173) - summ in ENGL, RUSS

The experience with the treatment of 48 patients using the Ilizarov apparatus is reported. It is employed for compression osteosynthesis in eleven patients with traumatic pseudarthrosis, for limb lengthening (27), for femoral head distraction in congenital dislocation of the hip joint (3), and for compression arthrodesis (7). In all patients with traumatic pseudarthrosis undergoing treatment, of whom four sustain intercurrent infection, bony union took place within five months average. The limb elongation attained varied from 2 to 12 cm (26 cases). In one patient alone the distraction had to be discontinued because of suppuration around the wires. The duration of treatment ranged from 2 to 7 1/2 months. Bony union occurred in six patients of the compression arthrodesis group, while in one treatment it is still in course. The errors and complications in extralocal compression-distraction osteosynthesis are also discussed.

3744. The Bagby compression bone plate - Bagby G.W. - 424 South Cent. Med. Bldg, Spokane, Wash. 99204 USA - INT. ORTHOP. 1978 1/4 (287) - summ in FREN

A compression bone plate was designed in 1956 by modifying a Collision plate. The advantage in fracture healing is seen as improved fixation rather than any effect on osteogenesis due to the compression. Bagby developed (1956) the first self-compression plate. In spite of the small numbers of fractures in 18 years and the lack of results this article is published as a historically interesting contribution.

6.14. Skin

3745. Diadermic microthermometry. (Preliminary evaluation with integrated circuit detector in experimental burns) (Ital) - LA MICROTERMOMETRIA DIADERMICA (VALUTAZIONE PRELIMINARE CON RIVELATORE A CIRCUITO INTEGRATO IN

USTIONI SPERIMENTALI) - Dioguardi D. and Musajo Somma A. - Catt. Chir. Plast. Ricostr., Univ. Studi, Bari ITA - RIV. ITAL. CHIR. PLAST. 1975 7/1-3 (505-510) - summ in ENGL

Studies were made on animals with experimental burns. Experiments were made in order to study the measurement of subcutaneous temperatures using a sensitive thermoelectric device which incorporates a thermistor as the temperature sensing element. On the basis of the many advantages inherent in this apparatus, it is necessary to improve this device in order to obtain a thermotopographic map of the burns.

3746. Percutaneous electrophoresis of amino acids and urea - Shaya S.Y., Smith C.W. and Heathcote J.G. - Dept. Elect. Engin., Univ. Salford GBR - MED. BIOL. ENG. COMPUT. 1978 16/2 (126-134) - summ in FREN, GERM

A noninvasive method for the percutaneous extraction and determination of samples of metabolites is described. It involves the use of a battery-operated, constant-current supply for obtaining the samples by 'in vivo electrophoresis'. These are then examined in respect of their amino acid and urea content by thin-layer-chromatography. The results of examinations made on the hand (thenar eminence) show an increase in the amino acids and urea collected at the electrodes under conditions of electrophoresis, over that collected at similar electrodes without the current. Possible applications are discussed.

3747. Energy dependence in the human cutaneous system in conditions of simultaneous, residual and reverse masking - Makarov P.O. and Matoyan D.S. - Dept. Biophys., Univ. Leningrad SUN - BIOPHYSICS 1977 22/1 (147-151)

The authors have investigated the dependence of the energy of a threshold stimulus on its duration in order to make an adequatometric analysis of the phenomena of simultaneous, residual and reverse masking in the human cutaneous system. Measurements were made with an electron-mechanical adequatometer yielding two stimuli shifted in time and separately regulated in duration and pressure. First they determined the thresholds of reception for the state of the system at rest and plotted the pressure-duration curves after which they measured the thresholds of reception against the background of masking and plotted the masking curves. From these findings they theoretically calculated the values of threshold energies for stimuli of different durations and plotted the energy-duration curves. Adequatometric analysis of the energy curves made it possible: to determine the quantitative and qualitative similarity of the patterns obtained in conditions of simultaneous, residual and reverse masking; to find the values of the intervals of masking in the period of residual masking; and to measure the critical time of detection of the threshold stimulus in conditions of reverse masking. The investigations carried out indicate the duration of the after-processes in the human cutaneous sensory system and the time of formation of the process of sensation.

6.16. Work and sport

3748. A review of personal sampling pumps - Wood J.D. - Inst. Occupat. Med., Edinburgh ENG - ANN.OCCUP.HYG. 1977 20/1 (3-17)

Ten models of personal sampler pump have been evaluated. Details of their design and construction are discussed, and criteria of performance for an ideal sampling pump are suggested. A rationale for the test procedure is given, with reference to the ideal. Some pumps are shown to possess near-ideal performance in certain respects but in choosing a pump other factors, such as cost and weight, must be taken into consideration. Information is given in both graphical and tabular form which will assist a potential user in selecting the most appropriate pump.

3749. Effect of load, speed, and activity history on the EMG signals from the intact human muscle - Miller N. and Seireg A. - Mech. Engin. Dept., Univ. Illinois, Urbana, Ill. USA - J. BIOENG. 1977 1/2 (147-155)

A specially instrumented bicycle ergometer is utilized in this investigation to induce reproducible loading conditions on the muscles of the lower extremity at different speeds. Various techniques for evaluating the electromyographic signals from the vastus medialis muscle are investigated for different load and speed conditions and shown to be essentially equivalent. The RMS signal power computed by means of a real time spectral analyzer is shown to be a convenient means of quantification of the dynamic EMG signals. The electromyographic signals are shown to be stable under repeated static or dynamic conditions but not under sustained isometric static loading.

3750. Practical choice of individual ear protectors (Germ) - DIE AUSWAHL VON PERSONLICHEN SCHALLSCHUTZMITTELN IN DER PRAXIS - Kuhn H.D. - Sudd. Eisen- und Stahl-Berufsgenossensch., Nurnberg GFR - ZENTRALBL. ARBEITSMED. ARBEITSSCH. PROPHYL. 1978 28/3 (81-85)

To make a choice of ear protector noise rating level, ear diagnosis, and frequency dependence of the attenuation must be considered. By connecting noise rating level with typical sounds caused by different methods of working and with 3 single attenuations of ear protectors for 3 frequency ranges is shown a simplified method of making a choice of ear protector. Thereby the ear diagnosis by an industrial physician is an important factor. The partially great differences between attenuations of different manufactures of ear protectors must be considered, too.

3751. Effectiveness of osha sanctions in influencing employer behavior: single and multi-period decision models - Gleason J.M. and Barnum D.T. - Coll. Business Adm., Univ. Nebraska, Omaha, Nebr. 68101 USA - ACCID. ANAL. PREV. 1978 10/1 (35-49)

This paper examines, from a decision theory perspective, the effects of sanctions for first instance violations of Occupational Safety and Health Act standards. Current OSHA penalty provisions and administration are discussed. Single and multi-period

decision models are developed, based on historical inspection and citation data. It is noted that, in general, a rational economic decision maker would choose not to comply with the Act until he were cited and forced to do so. Finally, recommendations for more effective public policy are suggested.

6.17. Radiology

3752. The DECATRON remote afterloading with high dose rate in brachy-Curie-therapy (Germ) - DAS DECATRON REMOTE-AFTERLOADING MIT HOHER DOSISLEISTUNG IN DER KONTAKT-CURIE-THERAPIE - Glaser F.H., Rauh G., Grimm D. et al. - Abt. Strahlenther., Radiol. Klin., Ber. Med., Martin-Luther-Univ., Halle-Wittenberg DDR - RADIOBIOL. RADIOTHER. 1977 18/6 (707-716) - summ in RUSS, ENGL

The afterloading principle in gamma-ray brachytherapy with the use of a remote-controlled device offers the possibility of applying highly active radiation sources in the Curie range. The technical principles of the remote-afterloading method developed by the authors and the afterloading device Decatron, which was planned on the base of ¹⁹²Ir-sources, are presented. Possible fields of application are also briefly described. Clinical experiences and results will be published in another paper.

3753. Electromagnetic rheoangiometry: An extension of selective angiography - Kolin A., MacAlpin R. and Steckel R. - Biophys. Lab., UCLA Cent. Hlth Scis, Los Angeles, Calif. 90024 USA - AM. J. ROENTGENOL. 1978 130/1 (13-23)

A harmless magnetic field produced by an extracorporeal magnet induces in the blood vessels of a living subject electrical signals which carry information about regional blood flows. Loop probes of hairlike consistency equipped with fine electrodes can now be introduced percutaneously and selectively into the vasculature through angiographic catheters to pick up these magnetically induced signals at selected loci. In addition to a continuous record of phasic blood flow, the loop sensors provide signals which measure variations in vascular diameters, thus yielding a continuous record of active and passive vasomotion. Coupled with blood pressure recordings, these data will permit determination of the elastic constants of blood vessels in situ. The manifold capabilities of electromagnetic rheoangiometry for providing continuous records of these vascular parameters are illustrated in dogs with tracings using multichannel recorders which provide continuous information of arterial blood pressures, instantaneous and mean blood flows, and instantaneous and mean vascular diameter changes simultaneously in two nonadjacent arteries.

3754. Comparison of the performance of pigtail catheters with different number of sideholes - Schwartz L. and Vaughan-Neil E. - Gen. Hosp., Toronto, Ont. CAN - CATHETER. CARDIOVASC. DIAGN. 1977 3/4 (421-424)

The standard 12 sidehole pigtail catheter is compared with pigtail catheters with 6, 8, and 10

sideholes in 40 patient studies. The catheter with fewer sideholes performed as well as the standard catheter with respect to the quality of left ventricular opacification, lack of catheter recoil during angiography, and absence of complications. An in vitro study confirmed that better flushing of the terminal segment beyond the sideholes is achieved with the 6 sidehole catheter compared to the 12 sidehole catheter. It is anticipated that this feature will decrease the risk of thromboembolism associated with the use of the pigtail catheter.

3755. Transbrachial selective arteriography of the neck vessels: our experience in 258 cases - Londero H.F. and De La Fuente L.M. - Prof. Luis Guemes Found., Buenos Aires ARG - CATHETER. CARDIOVASC. DIAGN. 1977 3/4 (425-434)

The authors have developed a catheter that facilitates the study of the neck vessels via a brachial arteriotomy so that other vascular areas (heart, kidneys, etc) can be studied in the same procedure. The catheter has a preformed curvature with a tapered, closed-end distal tip. The authors have successfully utilized this catheter in 258 consecutive patients, 133 (52%) of whom had undergone concurrent studies of other vascular areas, usually cardiac catheterization with coronary arteriography. No major complications occurred with the use of this catheter. The authors have found that with this catheter they can study the neck vessels via the brachial approach safely and easily and perform studies of other vascular areas using the same arteriotomy.

3756. Linearizing mechanisms in conventional tomographic imaging - Orphanoudakis S.C., Strohbehn J.W. and Metz C.E. - Dept. Diagn. Radiol., Yale Univ. Sch. Med., New Haven, Conn. 06510 USA - MED. PHYS. 1978 5/1 (1-7)

Implicit in the concept of conventional tomography and in any attempt to characterize the tomographic process by a modulation transfer function is the assumption that the tomographic process is linear. A Fourier decomposition approach and an analysis of nonlinear contributions to the integrated tomographic image intensity are used in this paper to establish the validity of this assumption to determine the mechanisms by which the tomographic process is effectively linearized.

3757. Computed tomography of pediatric head trauma: Acute general cerebral swelling - Zimmerman R.A., Bilaniuk L.T., Bruce D. et al. - Dept. Radiol., Hosp., Univ. Pennsylvania, Philadelphia, Pa. USA - RADIOLOGY 1978 126/2 (403-408)

General cerebral swelling was the most common CT finding in 100 pediatric patients with acute head injury, and was demonstrated by CT as absence or compression of the lateral and third ventricles and perimesencephalic cisterns. Up to 50% of the children who die from head injury are conscious on admission. The most common pathological findings are diffuse cerebral swelling, loss of cerebrospinal fluid spaces, and venous congestion of the cortex.

3758. A sign of subarachnoid bleeding on cranial computed tomograms of pediatric head trauma patients - Dolinskas C.A., Zimmerman R.A. and Bilaniuk L.T. - Dept. Radiol., Hosp. Univ. Pennsylvania, Philadelphia, Pa. USA - RADIOLOGY 1978 126/2 (409-411)

Of 109 children examined by cranial computed tomography soon after an acute head injury, a density in the region of the falx was identified in 24 patients, but disappeared on subsequent studies. The density measures in the range of blood and is thought to represent subarachnoid blood. It can be confused with falx calcification in adolescents and adults, but falx calcification is normally not seen in the pediatric population.

3759. Fast Fourier digital quantum mottle analysis with application to rare earth intensifying screen systems - Wagner R.F. - Div. Electron. Prod., Bur. Radiol. Hlth, FDA, Rockville, Md. 20852 USA - MED. PHYS. 1977 4/2 (157-162)

The advent of fast Fourier techniques has greatly facilitated the digital analysis of noise power spectra (Wiener spectra) by circumventing the need for the autocorrelation function. The authors are now able to Fourier analyze film data at about the same rate the microdensitometer-computer system can collect it (1000 points/sec). The new technique has been applied to the confirming earlier estimates from our pilot studies that such screens are capable of reducing exposure by a factor of about 2 with imaging parameters comparable to those of conventional calcium tungstate systems.

3760. Sequential trials with new rare-earth intensifying screens - De Carvalho A. and Jorgensen J. - Dept. Diagn. Radiol. R, Aarhus Kommunehosp., Aarhus DNK - FORTSCHR. GEB. RONTGENSTR. NUKLEARMED. 1978 128/4 (477-479) - summ in GERM

Sequential analysis of identical radiographs with calcium tungstate (CaWO_4), and rare-earth intensifying screens was performed in four test situations. Most preferences in the direction of rare-earth screens were due to motion unsharpness with CaWO_4 screens. Better contrast was found with rare-earth screens in one test situation in spite of low kVp exposures. Assessment of the quality of the radiographs in practical situations gave results which differed to a certain extent from what might be expected from the technical assessment of the properties of the screens.

3761. Systematic optimization of the double-scatterer system for electron beam field flattening - Abou Mandour M. and Harder D. - Inst. Med. Phys. Biophys., Univ. Gottingen GFR - STRAHLENTHERAPIE 1978 154/5 (328-332) - summ in GERM, FREN

The scattering foil widely used for field flattening in electron therapy produces a distortion of the electron spectrum which significantly reduces the slope of the descending part of the depth dose curve. It is already known that this effect can be drastically reduced by replacing the scattering foil by a two-foil scatterer. The

second foil, fit with a radial thickness profile, acts as a compensator, attenuating the central part and enhancing the peripheral part of the beam by electron scattering. Calculations of the optimal foil combinations and radial thickness profiles are presented and numerical values of smooth (Gaussian) and three-step profiles for various field sizes are provided. The results are applicable to a variety of electron energies and scattering foil materials.

3762. New individual tissue compensators for high-energy photons. I. Principle and procedure - Quast U. and Krause K. - Dept. Clin. Radiat. Phys., Radiol. Cent., Univ. Hosp., Essen GFR - STRAHLENTHERAPIE 1978 154/5 (333-341) - summ in GERM, FREN

The inhomogeneity of absorbed dose caused by irregular body surface contour in the treatment port for external photon radiation is shown as a problem. The discussion of the physical fundamentals and technical possibilities of missing tissue compensators leads to a practical solution. A new handy procedure is presented allowing easy and rapid preparing of geometrically minified as well as absorption- and stray radiation corrected individual compensators. The achievable dose homogeneity within the target volume is shown as better than +5%. Systematical errors are investigated for the different parameters. In Part II systematical preclinical tests and first practical clinical experiences will be discussed.

3763. An experimental 'trans-molybdenum' tube for mammography - Johnson G.A. and O'Foghluha F. - Dept. Radiol., Duke Univ. Med. Cent., Durham, N.C. USA - RADIOLOGY 1978 127/2 (511-516)

Possible mammographic advantages of 'trans-molybdenum' anodes (atomic number $> Z(\text{Mo})$) are decreased dose because the fluorescent radiation is more penetrating, and increased useful output; contrast degradation is known to be tolerable. The output per mAs, the HVT in Al, and the penetration in Lucite were measured spectroscopically for an experimental Rh anode tube and also for Mo and W anode mammographic tubes. The trans-molybdenum tube was shown to have output and dose advantages over Mo anodes, and output and contrast advantages over normal and selectively filtered W anodes. Possible applications in areas other than mammography are briefly discussed.

3764. The value of computed tomography in the evaluation of the enlarged head - Kingsley D. and Kendall B.E. - Lysholm Radiol. Dept. Nat. Hosp. Nerv. Dis., London GBR - NEURORADIOLOGY 1978 15/2 (59-71)

The contribution of computed tomography (CT) in the assessment of macrocrania has been examined with reference to a consecutive series of 93 cases. In the great majority a definitive diagnosis could be made without resorting to more noxious procedures. Hydrocephalus was present in 46% of this group. The incidence of macrocrania with childhood hydrocephalus and its relationship to the etiology and other CT features was examined with reference to 109

consecutive cases with hydrocephalus shown on CT. Macrocrania was present in only 11% of cases with an underlying tumor, but 71% with other obstructing lesions.

3765. Computed tomography in syringomyelia and the associated Arnold-Chiari type I malformation - Forbes W.St.C. and Isherwood I. - Dept. Diagn. Radiol., Univ. Manchester GBR - NEURORADIOLOGY 1978 15/2 (73-78)

A total of 20 patients with an Arnold-Chiari Type I malformation, i.e. without skeletal abnormality and associated with a syringomyelic syndrome, were studied using the EMI Whole Body Scanner CT5000. Two groups were considered: a retrospective series of 12 patients without intrathecal water soluble contrast media and a prospective series of eight patients after the introduction of intrathecal Metrizamide. In the first group tonsillar herniation could not be conclusively identified on CT and cord visualization was possible in only two cases. In the second group, tonsillar herniation and cord expansion were consistently demonstrated. Cord cavitation has also been detected. In both groups it was possible to assess the size and position of the ventricular system. The results of this study indicate that evaluation of the upper cervical cord cerebellar tonsillar herniation, may be achieved, but only following opacification of the CSF. The precise extent of cerebellar tonsillar herniation may be difficult to evaluate. The reasons for these findings are discussed.

3766. An instrument for aligning patient-positioning lasers - Horwitz N.H. and Forsaith A.L. - William Beaumont Hosp., Royal Oak, Mich. 48072 USA - MED. PHYS. 1978 5/2 (164-166)

The accurate adjustment of patient-positioning lasers is difficult and tedious. An optical instrument has been developed which enables rapid and extremely accurate adjustment of these. The instrument may be applied to several other tests of the alignment and adjustment of teletherapy and simulator machines.

3767. A highly accurate focal spot camera. Laboratory and field model - Roeck W.W. and Milne E.N.C. - Univ. Toronto Radiol. Res. Lab., Toronto CAN - RADIOLOGY 1978 127/3 (779-783)

A device has been developed to determine accurately and quickly the shape, size and intensity distribution of an x-ray tube focal spot. The pinhole device weighs only 1 kg and is portable, enabling it to be used either as a field unit or in a laboratory. The special design obviates any risk of irradiation danger to the investigator, or thermal overloading of the x-ray tube under investigation. The degree of accuracy with which the central beam can be located is better than ± 250 micron, well beyond the requirements of the latest NEMA standards regarding dimensional measurements of diagnostic x-ray tube focal spots. A star test pattern may be taken instead of the pinhole picture if required. The device is described and areas of application are discussed.

3768. Closed-circuit television monitoring of

problematic radiotherapy patients - Popkin M.K., Prem K.A., Hall C.W. et al. - Dept. Psychiat., Univ. Minnesota Med. Sch., Minneapolis, Minn. USA - RADIOLOGY 1978 127/3 (832)

The authors suggest that closed-circuit television be used to monitor patients who cannot understand or cooperate with hazardous medical treatment.

3769. Source coding of X-ray pictures - Kunt M. - Signal Processing Lab., Ecole Polytechnique Fed., Lausanne SW1 - IEEE TRANS. BIO-MED ENG. 1978 25/2 (121-138)

The feasibility of three specific coding schemes for compact storage or fast transmission of radiographic images is investigated. These schemes are: the synthetic high system, the block-coding system, and the run-length coding system. The last two techniques are used for encoding bit planes. The dependence of the compression ratio on image resolution and the feasibility of adaptive coding of bit planes are also examined.

3770. Use of an alternating pressure pad to reduce patient back pain during neuroangiography - Lamb S.A. and Mani R.L. - Dept. Radiol., Univ. California Sch. Med., San Francisco, Calif. 94143 USA - RADIOLOGY 1978 128/2 (510-511)

The authors describe a method of reducing patient back pain during neuroangiography. An alternating pressure pad cushions the body with constantly moving air.

3771. A film changer for small animals - Goldman M.L., Sprawls P., Weens H.S. and Gilliam W. - Dept. Radiol., Emory Univ. Sch. Med., Atlanta, Ga. 30322 USA - RADIOLOGY 1978 128/2 (512)

A 70mm spot-film camera was modified for use in small-animal studies. The film is exposed directly by X rays and yields a high-quality image.

3772. A channel-plate image intensifier for hard X-rays - Chalmerton V. - Lab. Electron. Phys. Appl., Limeil Brevannes, Val de Marne FRA - PHILIPS TECHN. REV. 1977 37/5-6 (124-130)

In industrial radiography the objects usually give greater absorption than in medical X-ray diagnostics. For this reason it is often necessary to use higher supply voltages for the X-ray tube in industrial applications than in medical applications. A higher tube voltage has 2 advantages here: the X-rays generated have a shorter wavelength and thus a greater penetrating power, and a higher radiation intensity is generated for the same dissipated power. To satisfy the requirements for radiation protection at the higher voltages, the X-ray tube and the object under investigation are placed in a cage that has to be locked during irradiation and whose walls are lined with lead. If the information is not to be recorded on X-ray film, which does not give immediate results and uses raw materials such as silver, which is becoming extremely expensive, then the information must be obtained in a suitable form for display outside the cage on a closed-circuit television system. An X-ray image intensifier has been designed for this purpose and optimized for a

tube voltage of 400 kV, a voltage that is used in industrial radiography for a number of special applications (e.g., in pipelines and spacecraft).

3773. High-resolution real-time ultrasonic imaging systems for medical use - Iinuma K., Kidokoro T. and Takemura Y. JPN - TOSHIBA REV. 1978 NO. 114 (13-17)

An electronic linear-scanning system for diagnosis of the abdomen and an electronic sector-scanning system for diagnosis of the heart are presented and discussed.

3774. Sectioned methods for image restoration - Trussell H.J. and Hunt B.R. - Los Alamos Sci. Lab., Univ. California, Los Alamos, N.M. 87545 USA - IEEE TRANS. ACOUST. SPEECH SIGN. PROC. 1978 26/2 (157-164)

Locally adaptive image processing methods are constructed by sectioning the image and applying a modified MAP restoration algorithm. These local algorithms are shown to be effective in processing nonstationary images. The algorithms can work in both signal-independent and signal-dependent noise. These gains achieved by local and signal-dependent processing are analyzed.

3775. Notes on linear image restoration by maximizing the A posteriori probability - Trussell H.J. - Los Alamos Sci. Lab., Univ. California, Los Alamos, N.M. 87545 USA - IEEE TRANS. ACOUST. SPEECH SIGN. PROC. 1978 26/2 (174-177)

A distinction is made between the minimum mean-square error estimate derived for the linear case of maximum a posteriori restoration and the common Wiener estimate. The linear MAP filter is shown to produce good results with less a priori knowledge than is required for the Wiener filter.

3776. NMR imaging: Image recovery under magnetic fields with large non-uniformities - Hutchison J.M.S., Sutherland R.J. and Mallard J.R. - Dept. Med. Phys., Univ. Aberdeen, Aberdeen AB9 2ZD GBR - J. PHYS. E. SCI. INSTRUM. 1978 11/3 (217-221)

In the field of NMR imaging using selective excitation techniques, a procedure is described whereby image information can be recovered with acceptable fidelity in the presence of large magnetic field non-uniformities. It entails only the running of a reference uniform sample under the same conditions as the unknown and performing a kind of deconvolution of signals. By this means, a number of different kinds of distortion can be compensated, without requiring any detailed knowledge of the particular magnetic field non-uniformity involved.

3777. Image segmentation and feature extraction - Sklansky J. - Sch. Engin., Univ. California, Irvine, Calif. 92717 USA - IEEE TRANS. SYST. MAN CYBERN. 1978 8/4 (237-246)

An overview of present computer techniques of partitioning continuous tone images into meaningful segments and of characterizing these segments by sets of 'features' is presented. Segmentation often consists of two methods: boundary detection and texture

analysis. Both of these are discussed. The design of the segment and feature extractor are intimately related to the design of the rest of the image analysis system, particularly the preprocessor and the classifier. Toward aiding this design, a few guidelines and illustrative examples are included.

3778. Iterative histogram modification - Rosenfeld A. and Davis L.S. - Comp. Sci. Cent., Univ. Maryland, College Park, Md. 20742 USA - IEEE TRANS. SYST. MAN CYBERN. 1978 8/4 (300-302)

Histogram peaks can be sharpened using an iterative parallel process in which large bins grow at the expense of nearby smaller bins. When the gray level histogram of an image is modified in this way, and the original image gray levels are mapped into the new ones defined by the modified histogram, the result is an enhanced image that consists primarily of gray levels corresponding to the original peaks. This modified image can be segmented very easily into regions whose gray levels belong to the original peaks.

3779. Density reconstruction using arbitrary ray-sampling schemes - Horn B.K.P. - Artific. Intellig. Lab., Dept. Electr. Engin. Comp. Sci., Massachusetts Inst. Technol., Cambridge, Mass. 02139 USA - PROC. IEEE 1978 66/5 (551-562)

Methods for calculating the distribution of absorption densities in a cross section through an object from density integrals along rays in the plane of the cross section are well-known, but are restricted to particular geometries of data collection. So-called convolutional-backprojection-summation methods, used now for parallel-ray data, have recently extended to special cases of the fan-beam reconstruction problem by the addition of pre- and post-multiplication steps. In this paper, a technique for deriving reconstruction algorithms for arbitrary ray-sampling schemes is presented; the resulting algorithms entail the use of a general linear operator, but require little more computation than the convolutional methods, which represent special cases. The key to the derivation is the observation that the contribution of a particular ray sum to a particular point in the reconstruction essentially depends on the negative inverse square of the perpendicular distance from the point to the ray, and that this contribution has to be weighted by the ray-sampling density. The remaining task is the efficient arrangement of this computation, so that the contribution of each ray sum to each point in the reconstruction does not have to be calculated explicitly. The exposition of the new method is informal in order to facilitate the application of this technique to various scanning geometries. The variant operators encountered in the general case. The technique is illustrated by the derivation of an algorithm for parallel-ray sampling with uneven spacing between rays and uneven spacing between projection angles. A reconstruction is shown which attains high spatial resolution in the central region of an object by sampling central rays more finely than those passing through outer portions of the object.

3780. The latest improvement in dental X-ray tubes.

General introduction of recent dental X-ray application, and improved and developed dental X-ray tubes used for small-sized apparatus and dental tomography - Yamamura T. and Sawa T. JPN - TOSHIBA REV. 1978 No. 113 (29-33)

In this article, technological status on dental use X-ray tubes is outlined. Conventionally, for dental use X-ray tubes, a small size and small focal spot size apparatus has been used among stationary anode X-ray tubes. Recently, various apparatuses meeting various usage requirements are being manufactured, one step in a trend toward specified function X-ray tube development.

3781. X ray imaging - Hay G. - Dept. Med. Phys., Univ. Leeds, Leeds LS1 3EX GBR - J. PHYS. E. SCI. INSTRUM. 1978 11/5 (377-386)

The present state of the art of medical radiology is reviewed. After a discussion of contrast in the X ray image, the geometry and fine structure of the image details are described. An account of modern X ray image transducing techniques, such as fluoroscopy and radiography, is followed by a short discussion of the detection and perception of the resulting images by the human eye and brain. Finally, after brief reference to image enhancement processes, new types of transducer are described, including the new and powerful technique of computerised tomography.

3782. Introduction to computer aided tomography - Scudder H.J. - Corporated Res. Developm. Cent., Gen. Electr. Co., Schenectady, N.Y. 12301 USA - PROC. IEEE 1978 66/6 (628-637)

In recent years, computer aided tomography (CAT) has had a major impact on the medical fields of radiology and neurology and nuclear medicine. This paper introduces the basic physics and mathematics underlying the production of reconstructed tomographic images. It discusses the evolution and philosophies of different possible data collection and reconstruction schemes.

3783. Real-time macro- and microthermography - Hily C., Hunzinger J.J., Jatteau M. and Ott J. - Lab. Electron. Phys. Appl., Limeil-Brevannes Val-de-Marne FRA - PHILIPS TECHN. REV. 1977 37/9-10 (241-249)

Although the basic principle of infrared thermography is the same as for infrared viewing, the great difference is that it is a quantitative and much more rigorous technique. In thermography the image produced must be an accurate reproduction of the local variations of the surface temperature, and the technical means must be available that will permit an accurate analysis of the thermal effects observed. The description 'real-time' implies that changes in the temperature differences are observed immediately, e.g., on a display screen. The thermographic equipment developed earlier at LEP (Laboratoires d'Electronique et de Physique Applique), mainly for medical applications, had a minimum focusing distance of about 1 m. Optical devices have now been added to this equipment to bring it within the macro and micro ranges (focusing distances of 150 mm and 12 mm).

3784. Two-dimensional transmit/receive ceramic piezoelectric arrays: Construction and performance - Plummer J.D., Swartz R.G., Maginness M.G. et al. - Stanford Electron. Lab., Stanford, Calif. 94305 USA - IEEE TRANS. SONICS ULTRASON. 1978 25/5 (273-280)

Two-dimensional ceramic piezoelectric arrays, in which each cell may both transmit and receive ultrasonic information, are described. Their fabrication is based upon integrated circuit and hybrid construction techniques. High-voltage custom DMOS integrated circuits are used to provide the T/R capability. Detailed acoustic and electrical performance results on 16x16 prototype arrays operating at 2.4 MHz are presented. These measurements show the arrays to be adequate for many medical imaging and NDT applications and superior in performance to other reported 2D arrays, although not as high performance as commercially available single element transducers because of compromises in construction techniques required to achieve the 2D capability.

3785. Ultrasonic modification of experimental bruising in the guinea-pig pinna - Hustler J.E., Zarod A.P. and Williams A.R. - Dept. Med. Biophys. Anat., Univ. Manchester GBR - ULTRASONICS 1978 16/5 (223-228)

Both pinnae of anaesthetized male guinea-pigs were contused in a reproducible manner and one immediately treated with 0.75 MHz ultrasound at an average therapeutic intensity of 0.61 W cm^{-2} for a period of 2min. The lividity and rate of resorption of the resultant bruises were measured by a photometric method. The results fell into 2 distinct classes. In the majority of cases, the bruises formed on the insonated pinnae were significantly less intense and were resorbed at the same rate as their corresponding controls. In the remaining cases, ultrasonic irradiation resulted in an increased initial lividity and a significantly greater rate of resorption.

3786. High sensitivity image intensifier-TV detector for x-ray diffraction studies - Reynolds G.T., Milch J.R. and Gruner S.M. - Dept. Phys., Princeton Univ., N.J. 08540 USA - REV. SCI. INSTRUM. 1978 49/9 (1241-1249)

A sensitive, efficient image intensifier-TV x-ray detector is described that has been optimized for a large class of diffraction studies of biological structures. All of the major components are commercially available. The system is well suited to measuring the intensity of diffraction patterns that are weak, or changing with the time. Because there is no count rate limitation, it is particularly well suited for studies utilizing the high fluxes of synchrotron sources.

3787. Transaxial tomography camera with built-in photographic image reconstruction - Lindegaard-Andersen A. and Thuesen G. - Lab. Appl. Phys. III, Techn. Univ. Denmark, DK-2800 Lyngby DNK - J. PHYS. E. SCI. INSTRUM. 1978 11/8 (805-811)

Transaxial tomography is a radiographic technique that provides an image of a selected two-dimensional

section of a three-dimensional object. The present paper describes a new analogue recording system that uses a fan-shaped x-ray beam and a built-in photographic summation technique for image reconstruction. The performance of the camera is illustrated with different test samples.

3788. Differential thermoluminescence (DTL) - a new instrument for measurement of the thermoluminescence with suppression of blackbody radiation - Manche E.P. - Dept. Nat. Sci., York Coll., City Univ. New York, Jamaica, N.Y. 11451 USA - REV. SCI. INSTRUM. 1978 49/6 (715-717)

A new instrumental technique for the determination of thermoluminescent glow curves especially useful for investigation at high temperatures, is described. Two samples, identical in all respects except that one is preheated, are simultaneously heated. The light outputs from the samples are individually modulated at two different frequencies, fed to a single photomultiplier tube the output of which is amplified by two lock-in amplifiers. The selectively amplified signals are further fed to a differential amplifier which cancels out the undesirable blackbody radiation to give a signal due only to the luminophor. This technique conveniently extends the temperature range of thermoluminescence and further allows high-temperature investigation of emissions in the red region of the spectrum.

6.18. Anesthesia

3789. Hyperbaric oxygenation in a large hyperbaric chamber (Germ) - ANWENDUNGSMÖGLICHKEITEN DER SAUERSTOFFBEHANDLUNG IN DER GROSSEN HYPERBAREN KAMMER - Friehs G., Klepp G., Rader W. et al. - Dept. Thorax Hyperbare Chir., Univ. Klin. Chir., Graz AUA - MED. KLIN. (MUNICH) 1977 72/47 (2013-2018) - summ in ENGL

Hyperbaric oxygenation has been used routinely with 503 persons (1100 compressions) in a large walk-in hyperbaric chamber. Optimal interdisciplinary teamwork and mastering of the transportation problems by helicopter is mandatory to make this treatment accessible for patients in distant hospitals as an additional conservative management. In 51 operations under pressure (28 congenital heart disease cases) the luxury oxygenation was a protective measure. The procedure can be done safely with plenty of working time.

3790. A closed system surgical isolator for major elective abdominal operations - Joffe S.N., Thomson W.O., McGavigan J. and Trexler P.C. - Univ. Dept. Surg., Glasgow Roy. Infirmary, Glasgow GBR - WORLD J. SURG. 1978 2/1 (123-130) - summ in FREN

This prospective unrandomized study examined the usefulness of a closed system disposable surgical isolator that provided a germ-free environment for abdominal surgical procedures. In 30 patients who underwent clean and clean-contaminated operations, only 1 patient (3.3%) developed a stitch abscess compared to an 11.2% incidence of major wound

infection in 170 similar operations performed under conventional operating room conditions ($p < 0.05$). The surgical isolator did not delay the operation, gave excellent visibility, and did not interfere with surgical access. The surgical isolator provided a sterile environment despite environmental contamination with a variety of organisms, especially penicillinase-producing *S. aureus*, and deserves further assessment in high-risk patients in general surgery including transplantation surgery.

9. COMPUTER APPLICATIONS

3791. Application of the programmable calculator in reporting emergency toxicology data - Samuels R.W. - Gorgas Hosp., Balboa Heights PAN - CLIN. TOXICOL. 1977 11/5 (573-580)

The use of a programmable calculator in reporting the results of emergency toxicology analyses by personnel who do not routinely perform such analyses has eliminated the problems previously encountered due to unfamiliarity with a particular test or tests. The program that is used alerts the physician to those drugs that could possibly interfere in the screening tests used for emergency toxicology analyses and, in addition, provides him or her with an updated listing of popular street and recreational drugs and drugs of abuse in this area in the event that one of these is not detectable in the screening procedure.

3792. Graduate education in computer systems in medicine. A conceptual model CAN - MED. INFORM. 1978 3/1 (3-13)

A conceptual model of the graduate educational programme in medical informatics is discussed. Problems involved in different types of informatics training can be avoided by stressing the integrative aspects of a systems approach. This programme is designed to lessen the gulf between a higher level of hardware capability and the ability to use it. The increasing educational demands in medical information systems have put more pressure on educational establishments to respond more expertly.

9.1. Hospital automation

3793. Information system for blood grouping of patients - Biggio B., Jouvenceaux A. and Falcoz H. - Cent. Transf. Sang., Hop. Edouard Herriot, Lyon FRA - MED. INFORM. 1976 1/4 (237-244)

The immuno-haematology laboratory of the Blood Transfusion Centre of the Edouard Herriot Hospital at Lyon carried out 45,000 blood group tests in 1974, a number which exceeds the capacity of classical filing systems, whose use would require more work than the tests themselves; use of information systems allows easy storage of all the data related to blood groups and access in real time of these data. In the months and years to come, all the laboratories carrying out blood group tests in the Centre will have the use of the new system: every grouping performed by a laboratory will be available to all the others and to the medical services by way of the reference files of the patients. The laboratory possesses a terminal with CII Iriscope

300 screen and CII IS 180 printer, linked by tele-informatic network to the central CII Iris 60 computer of the Civil Hospital of Lyon, with 512 kbytes of central memory. With the help of the registration numbers of the patients, the user obtains information on the identity (name, forename, sex, date of birth, address) and any previous blood group test (whose results are hidden from the laboratory staff)? The two technicians who carry out the tests by turns enter their results blind (along with the patient's identity if this is not already in the file). The computer checks the agreement of the different tests and prints two copies of the group card, mentioning different tests with the place and dates. Every evening it prints the legal copy for the laboratory, looks after the charging of the tests, and allows activity statistics to be obtained. Different procedures permit special treatment of particular cases, such as the presence of an unusual antibody to be noted on the group card. Safety in transfusions is improved, and wasteful repetition of tests is avoided.

9.1.1. Laboratory techniques

3794. Computer-based audit to detect and correct overutilization of laboratory tests - Eisenberg J.M., Williams S.V., Garner L. et al. - Dept. Med., Univ. Pennsylvania, Philadelphia, Pa. USA - MED. CARE 1977 15/11 (915-921)

The authors developed a computer-based system to detect inappropriate use of the clinical laboratory and tested a program of physician education to reduce overutilization. They modified the hospital laboratory's computerized reporting system to identify medical patients with three or more determinations of lactic dehydrogenase (LDH) or calcium during the preceding seven days. They audited the charts of these patients, using explicit criteria, to determine whether multiple studies were justified. During the control period 51 per cent of the charts audited for multiple determinations of LDH revealed overutilization. During the study period, when physicians were notified if overutilization was found, 65 per cent of the charts showed overutilization. This difference was not significant. A simultaneous undisclosed audit of calcium determination also showed no change between the two periods. Therefore, this method is effective in detecting and measuring overutilization of the laboratory. It is a method which is easily adaptable to a hospital's computerized laboratory reporting system, and it can be applied without a computer. However, this program of notification and education of physicians is not effective in reducing overutilization. More effective methods of modifying physicians' use of laboratory tests need to be developed.

3795. A novel, semiautomated method for the estimation of free fatty acid in serum or plasma - Bowyer D.E., Cridland J.S. and King J.P. - Dept. Pathol., Univ. Cambridge GBR - J. LIPID RES. 1978 19/2 (274-280)

A modification of the semiautomated assay method of Antonis for free fatty acid is presented. Free fatty acids are extracted from serum or plasma into di-n-butyl ether-2-methoxyethanol; the extract is almost free from phospholipids. The acids are analyzed in a

portion of extract by a copper soap method using diphenylcarbazide. The extractant, being less dense than water, is easily separated from an aqueous phase both in the extraction of samples and in the assay of copper soaps. The assay is comparable in accuracy with well-tried titrimetric methods and is quicker and easier to operate.

3796. Experience with commercial systems for computer assisted interpretation of mass spectral data: Application to trace organic analysis of natural waters - Brenner L., Silver B. and Suffet I. - Chem. Lab., Police Dept., City Philadelphia, Pa. 19106 USA - J. ENVIRON. SCI. HEALTH PART A ENVIRON. SCI. ENG. 1978 A13/2 (149-166)

Experience of a novice in the use of commercial systems for computer assisted interpretation of mass spectra of compounds found in drinking water is presented. Recurring problems in GC/MS analysis of complex mixtures were analyzed by three computer systems: PBM, STIRS, and MSSS. Problems such as the presence of low level impurities, mixtures, quality assurance of reference spectra, and mass spectra which do not match reference spectra in the Registry of Mass Spectral Data are discussed. The performance of each system is discussed to aid the occasional or new user of these systems.

3797. A computer-based reporting system for bone marrow evaluation - Youness E. and Drewinko B. - Dept. Lab. Med., Univ. Texas System Cancer Cent., Houston, Tex. USA - AM. J. CLIN. PATHOL. 1978 69/3 (333-341)

A computerized system of reporting results of bone marrow examination has been implemented at The University of Texas System Cancer Center, M. D. Anderson Hospital and Tumor Institute, since 1975. All results are entered via the keyboard of cathode-ray tube (CRT) consoles and are instantly available to the attending physician in CRTs strategically located throughout the institution in patient-related areas. Differential counts are available within two to three hours after aspiration. Description of clot sections and smear, diagnosis, and differential diagnosis are completed within 24 hours. Permanent reports are also printed by the computer at regular intervals during the day. The physician can ask the computer for results on a given day or for a cumulative summary displayed in tabular or plot form. This system has proven efficient and rapid, not only for direct reporting of bone marrow examination results but also for storage and retrieval of patient information.

3798. Computer-controlled instrument system for sequential chemical testing III. Application to liver assessment - Cembrowski G.S., Larson F.C., Huntington R.W. III et al. - Dept. Med., Med. Sch., Univ. Wisconsin Cent. Hlth Sci., Madison, Wis. 53706 USA - CLIN. CHEM. (WINSTON-SALEM, N.C.) 1978 24/4 (555-561)

We used the previously described [Clin. Chem. 19, 1114 (1973)] and evaluated [Clin. Chem. 19, 1122 (1973)] computer-controlled instrument system for sequential chemical testing to select and perform tests

of hepatic status, to aid the clinician in the diagnosis of liver disease. Results for total bilirubin, aspartate aminotransferase, and alkaline phosphatase obtained from the continuous-flow analysis (SMA 12/60) admission screen were used by the instrument to determine selectively the values for γ -glutamyltransferase, alanine aminotransferase, creatine kinase, and total and direct bilirubin. Kit methods for the latter four tests were evaluated on the system; results were similar to manual procedures. A software, enzymatic ratemeter was found to be better than the previously described hardware ratemeter. The follow-up tests of serum prescribed by the system are compared to clinician-prescribed follow-up tests and discharge diagnoses. In 10 of 19 cases, the system and clinician ordered similar follow-up tests; in three cases follow-up differed, and in six cases, the system ordered follow-up tests and the clinician ordered none.

3799. Bacteriology - moving aside to make room for machines - Johnston H.H. - Dept. Pathol., Radcliffe Infirmary, Oxford GBR - LAB. EQUIP. DIG. 1978 16/8 (37-40)

Laboratory drug sensitivity testing is a notoriously hit or miss affair especially when accurate diagnostic predictions are required. This article looks at the new generation of automated equipment.

9.2. Medical history

3800. Echinococcal cyst of the liver seen on computed tomography - Newmark H. III, Smith J.J., Burrows R. and Silberman E.L. - Dept. Diagn. Radiol., Century City Hosp., Los Angeles, Calif. 90067 USA - J. COMPUT. ASSISTED TOMOGRAPHY 1978 2/2 (231-232)

A case of a single, large, noncalcified echinococcal cyst of the liver demonstrated by computed tomography (CT) and verified at surgery is presented. To our knowledge, no previous CT pictorial display of such a lesion has been reported in the literature. The cyst appears as a radiolucent, sharply demarcated lesion of water density.

3801. An evaluation of the performance characteristics of different types of collimators used with the EMI brain scanner (MKI) and their significance in specific clinical applications - Thomas S.R., Schneider A.J., Kereiakes J.G. et al. - Radiol. Dept., Univ. Cincinnati Med. Cent., Cincinnati, Ohio 45267 USA - MED. PHYS. 1978 5/2 (124-132)

The characteristics of various types of collimators have been studied systematically for the EMI Mark I brain scanner. The degree of collimation ranged from the 13-mm adjacent A and B slices to 3-mm separated slices. Multiple phantom studies (including variable density immiscible liquid interfaces) have been performed to evaluate the effect of collimation on: the line-spread function; the change in effective absorption number; volume averaging. Effects associated with the technique settings involving the kVp, the mA, and the scan time were also investigated. The results of TLD dose measurements as a function of collimation are presented. The significance of collimation in specific

clinical studies involving small, fairly well-circumscribed lesions is discussed.

9.3. Clinical diagnosis

3802. Computer assisted diagnosis of hematological diseases in hospital patients (Germ) - KLINIKNAHE COMPUTERUNTERSTUTZTE DIAGNOSTIK. AM BEISPIEL DER HAMATOLOGIE - Spechtmeyer H., Wichmann H.E. and Gross R. - Med. Univ. Klin., Köln GFR - DTSCH. MED. WOCHENSCHR. 1978 103/13 (545-549) - summ in ENGL

A system of computer-assisted diagnosis is described which, in analogy to conventional diagnosis, takes into account both logical and statistical factors. The arrangement of such a system makes it clear that, after a period of successful use in specialist branches of medicine, a phase of less spectacular success has occurred which, however, provides the conditions for including larger areas of medicine in computer-assisted diagnosis. These systems are likely to conform more closely to the needs of the doctor than previous ones. Whether they can be used in non-hospital practice would depend largely on whether the questions put to the system by the doctor do not take more time and answers can be given in short, easily understandable form. The best type of answer as well as the transmission of information can be discovered empirically. The differential diagnostic level of computer-assisted diagnosis is, according to present experience, quite satisfactory but can be further improved. This development is greatly helped by continuing increases in the speed of calculators and their data storage capacity.

9.4. Electrodiagnosis

3803. Digitization of high-frequency ultrasonic signals for tissue differentiation in ophthalmology - Lepper R.-D., Reuter R. and Trier H.G. - Klin. Inst. Exp. Ophthalmol., Univ. Bonn GFR - BIOMED. TECH. 1978 23/4 (75-78) - summ in GERM

Computerized processing of ultrasonograms permits the determination of characteristic features of examined tissue. For statistical analysis a vast amount of data has to be digitized and processed. Digitization can be quite troublesome in the case of organs that can be examined with high frequency ultrasound, if noise and a large bandwidth are involved. This paper deals with the problems of digitizing ultrasonograms of the human eye with spectral components of up to 25 MHz and suggests solutions. At present the use of suitable signal storage tubes is suggested.

3804. The use of the computer in case records of radiotherapy - Legras B., Lambert J., Potdevin M. and Schoumacher P. - Sect. Informat. Med., Nancy FRA - J. BELGE RADIOL. 1977 60/6 (473-482) - summ in FREN, DUTC

This article deals with computer processing of the files of patients treated with external radiotherapy and curietherapy. Fortran written programs make it possible to sort and select case records. They also allow

for either complete or condensed statistics and reports. The files are linked automatically and their number may gradually be increased so as to make up a complete and open-end record. These files may be added to the general information sent to the common file of all French cancer-treating centers.

9.4.2. Electroencephalography

3805. The cerebral function analyser monitor (CFAM) - Maynard D.E. ENG - ELECTROENCEPHALOGR. CLIN. NEUROPHYSIOL. 1977 43/4 (No. E 115)

The cerebral function monitor (CFM) (Maynard et al, 1969, Brit. Med.J. 4,545) is a means of monitoring EEG on one channel of a slow speed chart recorder over long periods. A second channel monitors the electrode state and the presence of muscle activity. The CFM has been improved to provide frequency analysis in addition to an enhanced display of the level of cerebral activity. The new apparatus, called the cerebral function analyser monitor (CFAM), incorporates a 16 bit microprocessor. For the basic display, 1 channel has 3 lines showing: short term average peak, man and averager minimum levels of EEG. A second channel shows state of electrode contact and plots the proportion of activity in each of six frequency bands which may be selected in the range 0 to 40 Hz. Write outs are updated at 2 seconds intervals. Alternative displays may be selected, these include mean frequency although this is not recommended for anaesthesia monitoring because it can be misleading. Numerical information may be plotted, shown on a remote digital display, and transferred to external devices such as mini-computers. Prototype equipment is being used to monitor anaesthesia and the effects of hypoxia.

3806. A dynamic electroencephalogram frequency analyzer - Wallingford E.E. and Collins W.R. - Dept. Electr. Engin., Roy. Milit. Coll. Canada, Kingston, Ont. K7L 2W3 CAN - IEEE TRANS. INSTRUM. MEAS. 1978 27/1 (70-73)

A microprocessor is used for real-time frequency analysis of an EEG amplifier output through the use of a 32-point fast Fourier transform (FFT). The sixteen frequency components are gain equalized, then summed into the conventional delta, theta, alpha, and beta bands. A simultaneous display of successive processed FFT outputs on a storage oscilloscope along with base line references is of substantial aid in determining the relative activity in each. Simple changes in test conditions show considerable activity in the delta, theta, and beta bands. The alpha band surprisingly was relatively constant for many subjects through a large range of test conditions. Permanent copy is provided by photographing the CRT display or by direct printout of intermediate and/or final results on a Teletype or high-speed printer. System design parameters and preliminary results are discussed.

9.4.3. Electromyography

3807. Computer editing of electromyographic recordings - Magora A. and Gonen B. - Dept. Phys. Med. Rehab.,

Hadassah Univ. Hosp., Jerusalem ISR -
ELECTROMYOGR. CLIN. NEUROPHYSIOL. 1978
18/1 (35-43)

A new technique of analysis of EMG recordings is presented. It consists in the computer editing of the electrical activity into simplified shapes, in which the original duration, amplitude, shape, frequency and degree of superposition are exactly preserved and reproduced. The technique is not time consuming and permits accurate measurements.

9.7. Radiology

3808. A substitute for the water box in the original EMI brain scanner - Wickman G., Liliequist B. and Johansson R. - Dept. Radiat. Phys., Univ. Umea SWE - J. COMPUT. ASSISTED TOMOGRAPHY 1977 1/3 (333-337)

A modified water box for the EMI brain scanner is described. The modified box permits part of the body other than the brain to be scanned. The patient setup for brain scans is simplified, and motion artifacts have almost disappeared.

3809. Computerized time of flight ultrasonic tomography for breast examination - Glover G.H. - Gen. Elect. Res. Developm. Cent., Schenectady, N.Y. USA - ULTRASOUND MED. BIOL. 1977 3/2-3 (117-127)

A new approach to ultrasonic breast imaging is reported. Two-dimensional velocity distributions in tomographic slices transaxial to the breast are reconstructed from transmission time of flight projections. The data are displayed both as video images and in numeric format. Results of a clinical investigation in which both malignant and benign lesions have been observed are presented. The possibility of differential diagnosis of pathologies on the basis of velocity is discussed.

3810. Xenon ionization detectors for fan beam computed tomography scanners - Yaffe M., Fenster A. and Johns H.E. - Dept. Med. Biophys., Univ. Toronto CAN - J. COMPUT. ASSISTED TOMOGRAPHY 1977 1/4 (419-428)

Some of the physical characteristics of pressurized xenon ionization chambers as X-ray detectors for fan beam computed tomography scanners are presented. These include energy absorption efficiency, linearity of response, and sensitivity to scattered and off-focus radiation. A chamber 20 cm in length, pressurized with 5 atm xenon, will usefully absorb about 60% of the incident radiation. Its output can be made linear over a range of X-ray intensity of 10^3 or more. We have also found that, with proper detector collimation, scattered radiation is insignificant. A design for a large (239 chamber) detector for use in an experimental fan beam scanner is described.

3811. Gated computed tomography of the human heart - Sagel S.S., Weiss E.S., Gillard R.G. et al. - Mallinckrodt Inst. Radiol., Washington Univ. Sch. Med., St Louis, Mo. USA - INVEST. RADIOL. 1977 12/6 (563-566)

Production of in vivo images of the human heart, with delineation of the individual cardiac chambers and myocardial wall thickness, was accomplished by coupling a relatively simple electrocardiographic gating device to a translate-rotate type of computed body tomography scanner. Differentiation between the myocardial wall and the intracardiac blood pool was attainable in the patient with a normal hematocrit only when intravenous iodinated contrast media was used.

3812. Ideal application of computer tomography in the field of radiotherapeutic planning (Germ) - DIE BESTRAHLUNGSPLANUNG ALS IDEALES ANWENDUNGSGBIET DER COMPUTERTOMOGRAPHIE - Sabitzer H., Binder W. and Kumpan W. - Strahlentherapeut. Klin., Univ. Wien AUT - WIEN. KLIN. WOCHENSCHR. 1978 90/4 (141-143) - summ in ENGL

The value of computerized radiotherapeutic planning is illustrated by the case report of a patient with an extensive pelvic wall metastasis of a carcinoma of the uterine cervix diagnosed by conventional methods. The exact topography is delineated by computer tomography and enables optimum dosimetric radiotherapeutic planning.

3813. Role of computed tomography in the postoperative evaluation of infantile hydrocephalus - Palmieri A., Menichelli F., Pasquini U. and Salvolini U. - Sect. Neuroradiol., Dept. Radiol., Gen. Reg. Hosp. 'Umberto I', Ancona ITA - NEURORADIOLOGY 1978 14/5 (257-262)

The value of CT for the diagnosis and followup of infantile hydrocephalus is discussed. The ventricular volume, subependymal periventricular hypodensity, subdural hygroma or hematoma, position of catheter in the ventricles, ependymal inflammation and other occasional findings are considered.

3814. The use of computer tomography for radiation therapy of cerebral tumours (Germ) - DER EINSATZ DER COMPUTERTOMOGRAPHIE IN DER STRAHLENTHERAPIE DER HIRNTUMOREN - Kretzschmar K., Aulich A., Schindler E. and Kutzner J. - Abt. Neuroradiol., Johannes-Gutenberg-Univ., Mainz GFR - FORTSCHR. GEB. RONTGENSTR. NUKLEARMED. 1978 128/2 (226-231) - summ in ENGL

The application of computer tomography should be extended for indicating the need and choice of radiotherapy for cerebral tumours, and for observing the effects of treatment. In 26 patients it has been shown that CT is superior to conventional neuro-radiological methods in showing indications and in planning of radiation therapy. Forms of treatment can be suitably adapted where the histological type of the tumour is known. In most cerebral tumours, the beneficial effect of irradiation has been evident in the patients. The criteria were based on the concept of clinical malignancy, no attempt was made at a histological classification of the tumours.

3815. Computed tomographic evaluation of the diaphragmatic crura - Callen P.W., Filly R.A. and

Korobkin M. - Dept. Radiol., Univ. California, Sch., Med., San Francisco, Calif. USA - RADIOLOGY 1978 126/2 (413-416)

The diaphragmatic crura have a variable appearance on CT body scans. They can at times appear quite prominent and be easily confused with other anatomical or pathological structures. Analysis of the CT scans of 100 patients revealed certain characteristic features of the diaphragmatic crura that help distinguish them from other structures, especially enlarged para-aortic lymph nodes.

3816. Adrenoleukodystrophy. A correlative analysis of computed tomography and radionuclide studies - Furuse M., Obayashi T., Tsuji S. and Miyatake T. - Dept. Radiol., Jichi Med. Sch., Tochigi JPN - RADIOLOGY 1978 126/3 (707-710)

A discrepancy in location of abnormality has been noted between computed tomography (CT) and radionuclide studies in patients with adrenoleukodystrophy (ALD). Radionuclide concentration occurs only in the periphery of the lesion or area of active demyelinating process and no concentration is seen in the area of gliosis whereas gliosis appears as a low-density lesion in the CT scan. Forward migration of radionuclide uptake in the follow-up study is another characteristic feature of this disease.

3817. The ultrasonic and computed tomographic appearance of splenic lobulations: A consideration in the ultrasonic differential of masses adjacent to the left kidney - Gooding G.A.W. - Dept. Radiol., Univ. California Serv., VA Hos., San Francisco, Calif. USA - RADIOLOGY 1978 126/3 (719-720)

A splenic lobulation interposed between the tail of the pancreas and the left kidney is not uncommon. On prone ultrasonic scans, this variant of splenic configuration must be considered in the differentiation of anterior masses adjacent to the left kidney and masses originating in the tail of the pancreas. Computed tomography is the most sensitive method to use in making this distinction.

3818. The use of videotape for off-line viewing of computer-assisted radionuclide cardiology studies - Thrall J.H., Pitt B. and Marx R.S. - Univ. Michigan Med. Cent., Ann Arbor, Mich. USA - J. NUCL. MED. 1978 19/2 (210-212)

Videotape offers an inexpensive method for off-line viewing of dynamic radionuclide cardiac studies. Two approaches to videotaping have been explored and demonstrated to be feasible. In the first, a video camera in conjunction with a cassette-type recorder is used to record from the computer display scope. Alternatively, for computer systems already linked to video display units, the video signal can be routed directly to the recorder. Acceptance and use of tracer cardiology studies will be enhanced by increased availability of the studies for clinical review. Videotape offers an inexpensive flexible means of achieving this.

3819. A comparison of radiographic methods of diagnosing constrictive lesions of the spinal canal.

Toshiba unit vs. CT scanner - Post M.J.D., Gargano F.P., Vining D.Q. and Rosomoff H.L. - Dept. Radiol., Univ. Miami Sch. Med., Miami, Fla. 33152 USA - J. NEUROSURG. 1978 48/3 (360-368)

With the advent of computerized tomography (CT), a new method of visualizing the spinal canal in cross-section has been created. Before the introduction of CT scanning, evaluation of the cross-sectional anatomy of the spinal canal was accomplished chiefly by the Toshiba unit. This study compares these two forms of tomography and discusses their relative effectiveness in diagnosing constrictive lesions of the spinal canal.

3820. Computerized tomography and auditory-evoked potentials. Use in the diagnosis of olivopontocerebellar degeneration - Gilroy J. and Lynn G.E. - Dept. Neurol. Audiol., Wayne State Univ., Detroit, Ill. USA - ARCH. NEUROL. (CHICAGO) 1978 35/3 (143-147)

The pneumoencephalogram has been the only diagnostic test available to confirm the diagnosis of olivopontocerebellar degeneration during life. This study suggests that pneumoencephalography may be obsolete and that the diagnosis of olivopontocerebellar degeneration may be established by abnormalities seen during computerized tomography (CT) and by abnormal responses to auditory evoked potentials (AEPs). The combination of CT scans and AEPs provides a completely nontraumatic method of diagnosis in olivopontocerebellar degeneration and eliminates the need for pneumoencephalography.

3821. White matter of the cerebellum demonstrated by computed tomography: normal anatomy and physical principles - Maravilla K.R., Pastel M.S. and Kirkpatrick J.B. - Dept. Radiol., Univ. Texas Southwest. Med. Sch., Dallas, Tex. 75235 USA - J. COMPUT. ASSISTED TOMOGRAPHY 1978 2/2 (156-161)

Although computed tomography (CT) delineation of normal white matter of the cerebral hemispheres, has been well documented, there has been no description of white matter within the cerebellum. Through the use of phantom studies. CT number correlations between cerebellum and cerebral hemispheres, and anatomic correlation with in vitro specimens, the ability to visualize cerebellar white matter is demonstrated. Thin sections decrease volume averaging enable consistent imaging of these structures. Size and shape of the corpus medullaris on CT scan may vary with the scan angle and level of section. Representative examples of various normal appearances are illustrated.

3822. Correlation of computed tomography and serum tumor markers in metastatic retroperitoneal testicular tumor - Javadpour N., Doppman J.L., Bergman S.M. and Anderson T. - Surg. Branch, Nat. Cancer Inst., NIH, Bethesda, Md. USA - J. COMPUT. ASSISTED TOMOGRAPHY 1978 2/2 (176-180)

Preliminary findings of an apparently good correlation between computed tomography and serum tumor markers - human chorionic gonadotropin and alpha fetoprotein - are presented. These findings are from an ongoing prospective randomized study evaluating the efficacy of intensive chemotherapy and

cytoreductive surgery in metastatic retroperitoneal testicular germ cell tumors.

3823. Standardization of computed tomography images by means of a material-selective beam hardening correction - Rueggsegger P., Hangartner Th., Keller H.U. and Hinderling Th. - Inst. Biomed. Engin., Univ. Zurich SWI - J. COMPUT. ASSISTED TOMOGRAPHY 1978 2/2 (184-188)

Polychromaticity of the X-rays used in computed tomography (CT) has made it difficult to establish an absolute scale for values and has made quantitative comparison between patients unreliable. The spectral shift of the X-rays depends on the material distribution within the structure measured and is significant if substantial amounts of bone, fat or injected contrast material are present. A material-selective beam hardening correction procedure has been developed that allows the reconstruction of good approximations of linear attenuation coefficients with respect to a reference energy. With the aid of mathematical simulations and measurements on a physical phantom, the feasibility of the procedure and its insensitivity with regard to energy setting and other machine parameters are documented.

3824. Computer reconstructed sagittal and coronal computed tomography head scans: clinical applications - Maravilla K.R. - Dept. Radiol., Univ. Texas Southwest. Med. Sch., Dallas, Tex. 75235 USA - J. COMPUT. ASSISTED TOMOGRAPHY 1978 2/2 (189-198)

Recent technical advances in computed tomography (CT) have enabled evaluation of the head in multiple planes. A technique that utilizes computer reconstruction of data from 3 mm contiguous transverse scans to display images in sagittal and coronal planes is described. The clinical usefulness of this technique is discussed and illustrative cases are presented. Multiple plane CT evaluation has proven a valuable adjunct to axial plane CT scanning, which can provide better definition of the extent of lesions, facilitate treatment, and improve diagnostic accuracy in many cases.

3825. Utilization and cost-effectiveness of cranial computed tomography at a university hospital - Knaus W.A. and Davis D.O. - Dept. Clin. Engin., George Washington Univ. Med. Cent., Washington, D.C. USA - J. COMPUT. ASSISTED TOMOGRAPHY 1978 2/2 (209-214)

This study prospectively surveyed the utilization of cranial computed tomography (CCT) at The George Washington University Hospital over a 12-month period. Of 3,070 CCT scans studied, 1,098 (35%) resulted in a positive clinically important diagnosis for an overall case finding cost of \$800. Within each of 25 individual indications for scanning, classified on the basis of the patient's most specific sign or symptom, case finding costs varied from a low of \$411 for patients in coma to \$3,500 for patients with headaches as their only indication for CT scanning. Within two diagnostic categories, malignant brain tumors and cerebral aneurysms, there was significant agreement (p

< 0.001) between the prescanning diagnosis and the result on CCT. Overall there was also close agreement (correlation coefficient = 0.706) between the rank listing of the 25 indications for scanning compiled prior to CCT with that obtained after the scanning results were known.

3826. A simple method of localizing the level of computed tomography cross sectioning - Kuhns L.R., Seigel R. and Borlaza G.S. - Div. Ped. Radiol., C.S. Mott Child. Hosp., Univ. Michigan Med. Cent., Ann Arbor, Mich. 48109 USA - J. COMPUT. ASSISTED TOMOGRAPHY 1978 2/2 (233-234)

Before computed tomography (CT) scanning, a preliminary radiograph of the area of interest is obtained with a Bell-Thompson ruler on the table top parallel to the spine. This allows precise localization of the level of CT sectioning in relation to the vertebral column.

3827. Cerebellar hemorrhage in adults. Diagnosis by computerized tomography - Little J.R., Tubman D.E. and Ethier R. - Dept. Neurosurg., Montreal Neurol. Inst., Montreal, Quebec CAN - J. NEUROSURG. 1978 48/4 (575-579)

A series of 10 adult patients with cerebellar hemorrhage diagnosed by computerized tomography (CT) is described. Hypertension was the most common etiological factor, accounting for 70% of the cases. The clinical presentation appeared to fall into two basic groups. The first group (60% of the cases) ran a progressive course with early brain-stem compression. The second group had a benign course with findings of focal cerebellar dysfunction. The CT findings reflected the two clinical categories. The scans of Group 1 patients revealed a large hematoma (≥ 3 cm) and substantial ventricular dilatation. In contrast, scans of Group 2 patients demonstrated a small hematoma (< 3 cm) without ventricular dilatation. Use of CT scanning allowed the accurate differentiation of cerebellar hemorrhage from primary brainstem and intraventricular hemorrhage. The findings of the CT investigations proved very helpful in defining appropriate therapy.

3828. Cranial CT appearance of acute multiple sclerosis - Aita J.F., Bennett D.R., Anderson R.E. and Ziter F. - Dept. Neurol., Univ. Nebraska Med. Cent., Omaha, Nebr. 68105 USA - NEUROLOGY 1978 28/3 (251-255)

In acute multiple sclerosis, cranial computerized tomography (CT) may show periventricular and deep white matter contrast-enhanced lesions that are easier to see using 8 mm rather than 13 mm cranial CT sections. Follow-up studies show that the lesions evolve either to areas of density similar to the surrounding white matter or to low-density lesions. The authors presume they represent foci of active demyelination with extravasation of iodine through an altered blood-brain barrier. Enhanced cranial CT studies may be helpful in diagnosing acute multiple sclerosis and in following the course of the white matter lesions.

3829. Computerized tomography of brain and optic nerve in multiple sclerosis. Observations in 100 patients, including serial studies in 16 - Cala L.A., Mastaglia F.L. and Black J.L. - Dept. Diagn. Radiol., Univ. Dept. Med., Sir Charles Gairdner Hosp., Queen Elizabeth II Med. Cent., Nedlands AUS - J. NEUROL. SCI. 1978 36/3 (411-426)

Computerized tomography (CT) of the brain was carried out in 100 patients with established or suspected multiple sclerosis (MS). The optic nerves were also examined in 53 of these patients. Areas compatible with demyelinating lesions were found in the cerebral hemisphere white matter and less frequently in the brain stem in 47% of cases. The hemisphere lesions were commonly multiple, typically situated in the deep white matter and periventricular regions, and were often asymptomatic. Small areas with unduly low attenuation coefficients were found in one or both optic nerves in 52% of patients in whom the optic nerves were examined. While these areas may represent demyelinating lesions their significance remains uncertain in view of poor correlation with clinical and electrophysiological parameters of optic nerve damage. Cerebral cortical atrophy and/or ventricular dilation was found in 44% of cases, the frequency and severity of atrophy increasing with age and duration of disease. Serial studies after intervals of up to 21 months were performed in 16 patients, providing the opportunity to study the natural history of the cerebral lesions. While in some cases no significant change occurred, in others white matter lesions underwent in an increase or a reduction in size, and in some cases new lesions appeared. In some patients minor degrees of atrophy became apparent over the period of the study.

3830. Computerized axial tomography in cerebrovascular disease in the elderly - Caird F.I. - Univ. Dept. Geriatr. Med., South. Gen. Hosp., Glasgow GBR - ANGIOLOGY 1978 29/2 (114-120)

Computerized axial tomography has an important place in the investigation of elderly patients with cerebrovascular disease, particularly in those in whom there is doubt about the diagnosis. Its practical value rests largely on the fact that it is now possible to demonstrate cerebral infarction on a positive basis rather than by exclusion.

3831. The use of computer tomography in individual treatment planning (Germ) - EINSATZ DES COMPUTERTOMOGRAPHEN IN DER INDIVIDUELLEN BESTRAHLUNGSPLANUNG - Christ G. and Breitling G. - Med. Strahleninst., Univ. Tübingen GFR - FORTSCHR. GEB. RONTGENSTR. NUKLEARMED. 1978 128/4 (472-476) - summ in ENGL

Computer tomography provides the possibility of individual treatment planning. For this purpose it is necessary to obtain the matrix of linear absorption coefficient for the type of radiation used during radiotherapy. In this paper it is shown that it is necessary to obtain a cross section of the patient using rays of two different qualities. From these results and previous measurements on phantoms it is possible to

calculate the density and effective atomic number. It is also shown that the most significant information is obtained from the density matrix, if ultra hard X-rays are used for radiation therapy. With this density matrix it is possible in a simple manner to take account of inhomogeneities within individual patients.

3832. General purpose digital display system for computed tomography images - Tully R.J., McFarland W.D. and Lodwick G.S. - Dept. Radiol., Univ. Missouri Med. Cent., Columbia, Mo. 65201 USA - RADIOLOGY 1978 127/2 (539-541)

The authors describe a microprocessor-based digital image display system utilizing a solid-state image memory with a high quality television-type monitor for display of computed tomography images. It is an alternative to a commercially available display system, and offers the potential for research in digital image display. It is now under clinical evaluation. Image input to the stand-alone display system is via 9-track magnetic tape common to almost all CT machines, and it may be programmed to accept digital tapes from any type of CT machine and display them in a common format.

3833. Computers and quality control in nuclear medicine - Brookeman V.A. - Dept. Radiol., Univ. Florida Coll. Med., Gainesville, Fla. USA - SEMIN. NUCL. MED. 1978 8/2 (113-124)

The general topic of computers and nuclear medicine quality control may be approached from two main areas; controlling the quality of computerized studies, and computer application in general nuclear medicine quality control. Overlap occurs when quality control of computer studies is performed by the computer itself. The uses of computers in record-keeping and in quality control of imaging instrumentation and in vitro studies, including radioimmunoassay, are discussed in this review. Aspects of quality control for computerized clinical cardiovascular, cerebral, and renal studies and emission computed tomography are reviewed, including ovariectomized of difficulties and inaccuracies involved in the studies. Any automatic computer analysis program should incorporate adequate checks and error detection protocols and should illustrate results for verification. Current routine quality control procedures using the computer unfortunately are few. Quality control criteria are needed for camera/computer systems in high count rate clinical applications, and increasing emphasis should be aimed at quality control of those computerized dynamic and function studies in current clinical use. The computer has a valuable potential for nuclear medicine quality control. In vitro and computerized in vivo studies can be analyzed by readily available statistical programs, and variances can be monitored continuously. Computers can calibrate and monitor instrument performance regularly, and can handle managerial and clerical duties such as bookkeeping.

3834. Application of the computer to rapid dynamic studies - Knowles L.G. - Johns Hopkins Univ. Appl.

Phys. Lab., Laurel, Md. USA - SEMIN. NUCL. MED. 1978 8/2 (147-154)

Current trends in nuclear medicine to some degree, at least, reflect the level of sophistication available in the instrumentation. A technologically oriented speciality such as this might be expected to shift emphasis from time to time as stepwise advances are made in instrumentation. In its infancy, nuclear medicine concentrated on studies that could be accomplished with a single-probe system. The introduction of rectilinear scanners made imaging practical and of primary concern. Anger's gamma camera made combined static and dynamic studies possible using a single instrument - a decided advantage over previous methodology. The development of digital acquisition, processing, and display systems has had a profound effect on the recently increased emphasis on rapid dynamic studies. Computers are currently being applied to a broad range of clinical problems. Data preparation routines such as uniformity correction and data bounding often are used preliminary to more rigorous mathematical treatment. The development of reasonably low-cost, TV-type displays has greatly increased the quality of the computer display of the radionuclide imaging process.

3835. Computerised axial tomography in posterior fossa lesions - Thomson J.L.G. - Dept. Radiol., Frenchay Hosp., Bristol GBR - CLIN. RADIOLOG. 1978 29/3 (233-250)

The author found that 191 patients out of the first 6000 examined by the EMI brain scanner had lesions in the posterior fossa. Appearances in acoustic tumours, meningiomas, astrocytomas, haemangioblastomas, medulloblastomas, gliomas of the brain stem and metastases are described.

3836. Optimal use of image information using signal detection and averaging techniques - Frank J. - Div. Lab. Res., New York State Dept. Hlth, Albany, N.Y. 12237 USA - ANN. N.Y. ACAD. SCI. 1978 VOL.306 (112-120)

Averaging techniques are thought to be effective in reducing or eliminating radiation damage to biological objects. Theoretical and model computation studies indicate that by the use of digital correlation methods the averaging technique, so far developed for periodic objects, can be extended to unordered assemblies of particles with identical structure. In addition, a preliminary study of experimental data from stained specimens suggests that relative positions and orientations of particles can be identified despite their individual structural variations. The most effective way of extracting the particles suitable for averaging seems to be a combination of visual computer-aided selection and subsequent computer-controlled position refinement and orientation determination. The procedure, which can be considered a refined Markham superposition technique, is thought to be of practical value both for minimizing radiation damage of unstained specimens and for extracting biologically significant information from stained specimens.

3837. Diagnosis of ascending transtentorial herniation by cranial computed tomography - Osborn A.G., Heaston D.K. and Wing S.D. - Dept. Radiol., Univ. Utah Coll. Med., Salt Lake City, Ut. 84132 USA - AM. J. ROENTGENOL. 1978 130/4 (755-760)

The secondary effects of large infratentorial masses may include ascending transtentorial herniation. Rostral displacement of the superior vermis through the tentorial incisura can be accurately detected by cranial computed tomography. Signs of early or impending upward herniation are compression and slight posterior flattening of the quadrigeminal plate cistern. Progressively more severe herniation produces amputation of the peritactal cerebrospinal fluid diamond, leading to a triangular or 'squared off' appearance of the confluent quadrigeminal and superior cerebellar cisterns. When the disorder is severe, the herniated vermis plugs the incisura, completely effacing these cisterns and flattening the posterior third ventricle. Obstructive hydrocephalus may also occur with moderate or severe herniation.

3838. The vertex scan: an important component of cranial computed tomography - Wing S.D., Osborn A.G. and Wing R.W. - Dept. Radiol., Univ. Utah Coll. Med., Salt lake City, Ut. 84132 USA - AM. J. ROENTGENOL. 1978 130/4 (765-767)

Physicians who monitor cranial computed tomography occasionally omit the most superior aspects of the brain and calvarium because of time limitations and overloaded scanning schedules. In addition, standardized CT reporting forms as well as training literature distributed by some manufacturers support the concept that a complete CT series consists of three scan pairs. Omission of a vertex scan pair results in failure to visualize 10%-15% of the brain volume. The authors have reviewed the results of 2,000 consecutive CT studies to determine the number and variety of pathologic entities that would have been missed had a vertex scan not been obtained. The most significant or sole abnormality was present on the vertex scan alone in 3% of the cases. Examples are presented. A true vertex level should be obtained in every routine CT examination.

3839. Immediate pathologic confirmation of radiologic interpretations by computer feedback - Greenes R.A., Bauman R.A., Robboy S.J. et al. - Dept. Radiol., Lab. Computer Sci., Massachusetts Gen. Hosp., Boston, Mass. USA - RADIOLOGY 1978 127/2 (381-383)

A computer system is used to provide automatic pathology diagnostic feedback to radiologists. This feedback occurs on a daily basis whenever surgical specimens are obtained for which pertinent radiologic examinations have been performed. On-line inquiry capability is also provided. The implementation relies on linkage between two operational computer systems at Massachusetts General Hospital, for pathology specimen accession management and radiology examination scheduling.

3840. Computer processing of X-ray films. Preliminary report on arteriograms - Cortivo P., Dalla Palma L., Delcaro L. et al. - Inst. Radiol., Univ. Trieste ITA -

An X-ray processing system by computer is described. The scanning device and display are illustrated. The main processing methods are analyzed, in particular the linear and nonlinear ones. An example of image processing which is the base for future work is shown.

3841. Visualization of small extracranial neurilemmomas. By metrizamide cisternographic enhancement - Rosenbaum A.E., Drayer B.P., Dubois P.J. and Black F.O. - Dept. Radiol., Neuroradiol. Div., Univ. Pittsburgh Sch. Med., Presbyt. Univ. Hosp., Pittsburgh, Pa. 15261 USA - ARCH. OTOLARYNGOL. 1978 104/5 (239-243)

Metrizamide (Amipaque) computerized tomography cisternography (CTC) provides a rapid, simple, and accurate radiographic modality of intrathecal enhancement for detecting and morphologically characterizing cerebellopontine (CP) angle masses. The technique is of especial value in masses < 1.5 cm that are not detected on intravenously enhanced computerized tomography. Metrizamide CTC was used in six patients with no CP angle mass and in four patients with acoustic neurilemmomas.

3842. The positron emission tomography and its applications - Depresseux J.C. - Cent. Rech. Cyclotron, Clin. Med. B, Univ. Liege BEL - J. BELGE RADIOL. 1977 60/6 (483-500) - summ in FREN, DUTC

Emission reconstruction tomography is a branch of nuclear technology that advanced tremendously during the last five years. This progress is the result of the efforts for building more powerful detection machines in nuclear medicine, of the spreading of cyclotron research centers and of the increasing interest in the synthesis of radiopharmaceuticals. The paper reviews the basic principles of positron emission reconstruction tomography. The detection requirements are detailed on the basis of applicability of the projection equation and the unique advantages of the positron emitters are emphasized. Among the mathematical methods that may be potentially used for the image reconstruction, the technique of linear superposition of filtered backprojections is specifically described. The design of the tomographs that are presently in biomedical use and the configuration of the prototypes under study are briefly outlined. Some actual or desirable performances of the emission tomographs are discussed, such as spatial resolution, counting capabilities and time of examination. An overlook on the applications of positron emission tomography illustrates the fact that this technique opens nuclear medicine to up-to-now inaccessible investigations of physiological processes, metabolic pathways and pharmacodynamical problems.

3843. Radiotherapy treatment planning using the acta-scanner - Scheer A.C. and Ledley R.S. - Dept. Radiat. Oncol., Georgetown Univ. Hosp., Washington, D.C. 20007 USA - COMPUT. TOMOGRAPHY CHANGE OF CODEN USE: CTOMDS 1977 1/4 (275-282)

Computerized tomography is useful in radiotherapy treatment planning in the following ways: Its image

provides the most accurate possible contour of the patient and demonstrates the internal structure in their proper relation to each other. The tumor and its extension are accurately demonstrated. Corrections for tissue heterogeneities can be accomplished in one of two ways, either by arbitrary assignment of densities to tissues or by direct scanning with a therapy source. This latter procedure is under investigation. The computer can be programmed to demonstrate summations of dose delivered from multiple fields.

3844. New applications of old radiographic techniques applied to computed tomography - Gerzof S.G., Robbins A.H., Pugatch R.D. and Gerson E.S. - Dept. Radiol., VA Hosp., Boston, Mass. USA - COMPUT. TOMOGRAPHY CHANGE OF CODEN USE: CTOMDS 1977 1/4 (331-338)

Established techniques of routine radiography can be applied to a computed tomography (CT) examination of the body. The planned use of various positive and negative contrast agents placed intravascularly and intraluminally can yield important information not otherwise obtainable. When purposefully combined with selected positions, these agents allow the radiologist to tailor a CT examination to a specific clinical problem. Several combinations of these modalities which have been found useful in CT of the body, are described.

3845. Evaluation of intracerebral hematoma by computed tomography - Azar-Kia B. and Fine M. - Foster G McGaw Hosp., Loyola Univ. Med. Cent., Maywood, Ill. 60153 USA - COMPUT. TOMOGRAPHY CHANGE OF CODEN USE: CTOMDS 1977 1/4 (339-348)

The CT scan appearances of acute intracerebral hematomas are usually diagnostic, and can be differentiated from hemorrhagic tumor and infarction. Some prognostic evaluations can be made, depending on the site and size of the hemorrhage. Sequential studies indicate resolution of the density of the hematoma over a period of approximately six weeks. This however does not appear to correlate with pathological resolution, but does reflect the hemoglobin concentration in the hematoma. Angiography is indicated when an underlying AVM or aneurysm is suspected, whereas contrast infusion studies are not of great value in detecting these lesions.

3846. Unexpected brain hemorrhages and the value of computerized tomography - Greenberg J.O. and Skubick D.L. - Dept. Neurol., Episcopal Hosp., Philadelphia, Pa. 19125 USA - COMPUT. TOMOGRAPHY CHANGE OF CODEN USE: CTOMDS 1977 1/4 (349-357)

Intracerebral hemorrhage has been thought in the past to be manifested by sudden onset of hemiplegia, severe headache and deep coma proceeding to death in most cases. There are patients who present with less ominous symptoms who have heretofore been thought to have cerebral infarction or transient ischemic attacks who in reality have intracerebral hemorrhages. Computerized tomography has allowed us to identify these patients and to separate them from the large

group of patients with ischemic infarcts either due to thromboses or emboli. Six patients were reported with unexpected brain hemorrhages and their good prognosis is emphasized.

9.8. Medical record documentation

3847. The value of subjective appreciation in the medical record - I. The evaluation of dyspnoea - Lahaye D., Roosels D. and Viaene J. - Fund Occup. Dis., Min. Soc. Care, Brussels BEL - METHODS INF. MED. 1978 17/2 (100-103) - summ in GERM

In this paper the authors assess the value of some subjective appreciations of physicians 'dyspnoea' has on patients' history and clinical examination. The feature yspnoeahas been chosen for analysis by APL system of a standardized population of pneumoconiosis patients. On this sample ($n = 11,728$) the dyspnoea stage was correlated with the F.E.V. 1 value. Although the interindividual variation between physicians' evaluations is evident, the subjective dyspnoea staging shows a good correlation with the corresponding F.E.V. 1 alteration. Because of the large spread of the F.E.V. 1 results in each dyspnoea stage, however, the predictive value in the individual case is reduced.

3848. The value of subjective appreciation in the medical record - II. The evaluation of the general condition of the patient - Lahaye D., Roosels D. and Viaene J. - Fund Occup. Dis., Min. Soc. Care, Brussels BEL - METHODS INF. MED. 1978 17/2 (103-105) - summ in GERM

Based on the analysis of 13,110 medical examinations performed on a standardized population of pneumoconiosis patients recorded on the F.O.D. computer file, the authors describe the value of the subjective estimations of 'obesity', 'thinness' or 'normal weight' by their correlation with the observed weight and height. Although there are striking differences in appreciation between the physicians performing the examinations, the qualifications 'obese', 'thin', or 'normal' correspond with real group differences in weight, between certain limits which can be defined. The ratio between the observed weight and the expected weight (using the Broca formula) shows the same pattern. In this way it becomes possible to propose upper and lower limits for obesity, thinness and normal weight based on purely empirical data. Feeding back this information to the examining physicians should help reduce the differences between physicians and improve the results. Therefore, the authors find it useful to keep such information in the computer file.

9.9. Literature documentation

3849. The clash of interests in computer information services - Vickery A. - Library Resources Co-ordinating Committee, Univ. London GBR - INF. PROCESS. MANAGE. 1978 14/1 (37-43)

The university of London is a federal body consisting of over sixty colleges and institutes. The institutions differ in size, function and the degree of

autonomy. Each institution has at least one library, some colleges have departmental libraries of considerable independence from the main library. There are five major computer centres within the University, with large resources in hardware and specialist staff, and with many years of experience in the provision of services to the wide population of the University. A central Library Resources Co-ordinating Committee was formed in 1972 to coordinate the rich documentary resources of the University and to encourage the transfer and dissemination of information accumulated in its libraries. Under its administration, a Central Information Service headed by a Senior Information Systems Officer was initiated in October 1974. Its first task has been to undertake a large evaluation study of computer information services. Academic staff and postgraduate students have been exposed to a variety of experimental services and the impact of these services on the users has been assessed. Out of this work have come recommendations for continued provision of these services to the University in a cost-effective way. The paper considers the successes and setbacks of the project, and the reactions to it of the various parties involved -users, information officers, librarians and computer staff. The conflicts which arose during implementation of the project are discussed. They were caused by economic stringency at the University, technological changes introduced into libraries, and problems of charging for new computerised services.

9.10. Function tests and techniques

3850. A reversible method for sound analysis adapted to bio-acoustical experiments - Doerrscheidt G.J. - Lehrst. Allg. Zool., Ruhr-Univ., Bochum GFR - INT. J. BIO-MED. COMPUT. 1978 9/2 (127-145) - summ in FREN

The paper describes a method of sound analysis, 'modulation analysis', its implementation on a minocomputer PDP12 and some aspects of its application in bioacoustical experiments. Modulation analysis reversibly resolves a given sound signal into time-courses of amplitude and carrier frequency. Since time is preserved as the independent variable the method provides a suitable basis for the computer modification of sounds. Problems of practical performance are discussed with regard to sounds of birds and insects. Further, the use of sound modification in a neurophysiological study of the hearing system of birds is described.

9.10.1. Blood circulation

3851. Data processing system Phocar (Fren) - LE SYSTEME INFORMATIQUE PHOCAR - Nerron Y. and Chartrand C. - Sect. Chir. Cardio-Vasc., Dept. Chir. Exp., Hop. Ste-Justine, Montreal CAN - UNION MED. CAN. 1977 106/12 (1603-1607) - summ in ENGL

Because of the considerable amount of data resulting from experimental work done on pathophysiology of heart transplantation, the option was made to initiate the development of a computer system. Following a

systematic analysis of the problem, the PHOCAR system, as well as its different program components - has been established. Because of its reliability, flexibility and rapidity of data processing, the system in operation in the Cardio-Vascular Surgical Service at Hopital Ste-Justine has become of great aid to the ongoing research.

9.10.2. Respiratory system

3852. Computer system for recording and display of data from newborn infants with respiratory illnesses - Allen L.P., Clifton J.S., Ingram D. et al. - Dept. Paed., Univ. Coll. Hosp., London GBR - ARCH. DIS. CHILD. 1978 53/2 (169-172)

A computer system has been used for the recording and display of data from 277 infants with respiratory illnesses consecutively admitted to a neonatal intensive care unit during a period of 25 months. Improved efficiency of data handling was demonstrated, and the system proved valuable for teaching and research.

9.10.3. Nervous system

3853. Preparation and processing of clinical ERA-datas using a small laboratory computer: tentative experiences and results for the late, acoustically evoked potential N_1 (Germ) - AUFBEREITUNG UND VERARBEITUNG KLINISCHER ERA-DATEN MIT EINEM KLEINEN LABORRECHNER: VORLAUFIGE ERFAHRUNGEN UND ERGEBNISSE FÜR DIE SPÄTE, AKUSTISCH EVOZIERTE POTENTIALKOMPONENTE N_1 - Karnahl Th., Scheerer S. and Zoellner Ch. - Univ. HNO-Klin., Freiburg i.Br. GFR - LARYNGOL. RHINOL. OTOL. IHRE GRENZGEB. 1977 56/11 (937-943) - summ in ENGL

The efficacy of the Electric Response Audiometry (ERA) in the supraliminal range can be enlarged and improved by the use of laboratory computers. The acoustic system has to be described as objectively as possible from the lot of datas resulting especially from clinical examinations. An off-line-program sequence which may be routinely used, was elaborated for the laboratory computer PDP 12 in order to measure and evaluate the late, acoustically evoked potential N_1 . In addition to the organisation and documentation of the datas it is shown that for many cases the described and performed preparation and processing of the datas yield qualitatively and quantitatively better results.

3854. Computer-aided reconstruction of neuron trees from several serial sections - Capowski J.J. - Dept. Physiol., Univ. North Carolina, Chapel Hill, N.C. 27514 USA - COMPUT. BIOMED. RES. 1977 10/6 (617-629)

Computer-aided neuron tree reconstruction allows an anatomist to spatially visualize and statistically summarize the tree branching pattern. Trees which span several serial tissue sections present a difficult reconstruction problem. Segments of trees from different sections are traced separately with a computerized microscope relative to a constant tissue origin. With computer aid, sections are aligned with

respect to this origin. Individual tree segments can be displayed with possible merging points emphasized. Transposition of tree segments is performed on those segments whose tree origin was improperly selected. Finally, complete reconstructions are generated by merging origins of tree segments into cut ends of other tree segments. The reconstructed tree may be displayed with smooth rotation and translation; also it may be statistically summarized.

3855. Computer analysis of rapid eye movements - Dick G.L. - Sch. Optometry, Univ. New South Wales, Kensington AUS - COMPUT. PROGRAMS BIOMED. 1978 8/1 (29-34)

Simulation of the saccadic eye movement mechanism and, more recently, diagnosis of neuromuscular disorders associated with saccades rely on accurate recording and analysis of saccade characteristics. Traditionally, eye movements are monitored objectively by registering a transduced voltage correlate of eye position on a pen or cathode ray oscillograph. Analysis of the record obtained is tedious and often inaccurate. The advent of small digital computers with analog-to-digital capability permits more efficient recording. However, computer programs reviewed are limited to the analysis of specific saccade parameters or partly depend on manual operations. The computer program described stores the entire saccadic event of each eye between pre-defined limits including the pre- and post-saccade intervals. Preliminary operations including artifact identification, location of onset, elimination of RC decay, DC offset and amplitude scaling prepare the data for display and subsequent analysis. The program also includes a subroutine to derive the mean and standard deviation of successive saccades.

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<i>topic</i>	<i>section no. & name</i>
biochemical biophysics	29 Biochemistry
cardiovascular prostheses	18 Cardiovascular Disease
computer radiology	14 Radiology
hospital automation	36 Health Economics
monitoring	7 Pediatrics
	10 Obstetrics & Gynecology
	18 Cardiovascular Disease
	24 Anesthesiology
nuclear biophysics	23 Nuclear Medicine
physiologic measurements	2 Physiology
prothesiology	19 Physical Medicine & Rehabilitation
radiation physics & instrumentation	14 Radiology
	23 Nuclear Medicine
surgical instruments	9 Surgery
	33 Orthopedic Surgery
	34 Plastic Surgery

SUBJECT INDEX

(figures refer to item numbers)

- abdomen, b scan, echography, continuous raster scanning, 1429**
- computer assisted tomography, gallbladder disease, liver disease, varian six second body scanner, 34 cases, 1185
- computer assisted tomography, thorax, 3447
- echography, heart, image processing, ultrasonics, 3773
- abdomen scintiscanning, abdominal abscess, abscess scanning, computer assisted tomography, echography, gallium 67, 22 cases, 1175**
- abdominal abscess, abdomen scintiscanning, abscess scanning, computer assisted tomography, echography, gallium 67, 22 cases, 1175**
- abdominal aorta coarctation, aorta stenosis, artery pulse, blood flow, blood pressure, dog, reflection of pressure and flow waves, 471**
- abdominal aortography, aortography, catheter, catheter with multiple side holes, 736**
- abdominal cancer, cancer staging, computer assisted tomography, lymphography, malignant lymphoma, 30 cases, 1601**
- abdominal pain, acute abdomen, computer, computer assisted diagnosis, 1537 patients, diagnosis, 1161**
- abdominal radiography, computer assisted tomography, pancreas carcinoma, 574 cases, 1180**
- computer assisted tomography, contrast medium, kidney cancer, case report, man of 79, 823
- abdominal surgery, wound infection, 30 patients, treatment, closed system surgical isolator, 3790**
- abdominal viscera, camera, estrus, implantation, solid state camera, sheep, 1782**
- abdominal wall, computer assisted tomography, metastasis, radiotherapy, uterine cervix carcinoma, case report, 3812**
- computer assisted tomography, radiotherapy, therapy, tumor, whole body radiation, 16 years old girl, 1181
- fentanyl, muscle tone, rectus abdominis muscle, transducer, measurement, 143
- abortion, plastic, vacuum aspiration, metal versus plastic cannulae, 234**
- above knee amputation, below knee amputation, immediate prosthesis, weight bearing, load cell, 1118**
- above knee prosthesis, arm prosthesis, powered prosthesis, research program, 288**
- electromyography, leg prosthesis, myoelectric control, leg controller, 2263
- 44 cases, adjustable lightweight prosthesis, 709
- abscess scanning, abdomen scintiscanning, abdominal abscess, computer assisted tomography, echography, gallium 67, 22 cases, 1175**
- absorption spectroscopy, computer assisted tomography, estimation of chemical composition and density, 1598**
- acantholysis, chickenpox, herpes zoster, immunosuppression, staining, vesiculo bullous disorders, paragon multiple stain, 500**
- acceleration, back muscle, electromyography, impact, dog, 715**
- blunt trauma, deceleration, traffic accident, trauma, velocity, tolerance to impact acceleration, 2803
- body posture, impact, intervertebral disk, model, seat, musculoskeletal model, 3138
- cardiovascular system, headache, heart rate, mathematic model, stress, 2812
- computer model, head, impact, mathematic model, neck, motor vehicle crash victim, calspan 3 d computer simulator, 2426
- computer program, head, impact, intervertebral disk, neck, comprehensive, three dimensional head neck model, 2650
- computer program, eye, information processing, statistics, vestibular nystagmus, velocity, analog processing, cross correlation data analysis, 1497
- computer program, head, impact, mathematic model, muscle, neck, math modelling, volunteers, 1266
- gravitational stress, hand, mathematic model, neck, human head neck system, dynamic response, predictive model, 3008
- gravitational stress, head, neck, head neck dynamic response, 3007
- head movement, intracranial pressure, vibration, model, monkey, 3009
- human body, model, vibration, human body, reaction to external forces, 2677
- parkinson disease, telemetry, tremor, 40 patients, 523
- vehicle, vibration, ride comfort, quantification, 2651
- accelerometer, ataxia, encephalopathy, tremor, triaxial accelerometer, 3334**
- leg movement, telemetry, 1893
- accident, automobile industry, car driving, cost benefit analysis, risk factor, safety, usa, 1529**
- burn, catheter, fire risk, nasogastric tube, oxygen breathing, case, 229
- car driving, eye movement, vision, curve negotiation, 1120
- cost, law, rescue personnel, equipment, organization, minden gfr, 2575
- ergonomics, industry, accident theory, study in 15 industries, finland, 2265
- fatigue, human factors research, industry, safety, human error, pattern analysis, ortho oblique type binary

- data decomposition, 717
- head trauma, helmet, crash impact response, nonlinear numerical prediction, 2809
- research, safety, model, 3500
- accident prevention**, college, education, safety, university, curriculum, safety professional, model, 1830
- accommodation**, eye movement, retinoscopy, book retinoscopy, 1515
- infrared radiation, optometry, microvariation recording, infrared optometer, 2246
- acetal**, biocompatibility, cell culture, cytotoxicity, nylon, plastic, polyethylene, polystyrene, polyurethan, silastic, teflon, testing, 866
- acetylcholine**, cholic acid, cholinergic receptor, model, triton x 100, model evaluation, theatrical aspects, 12
- cholinergic system, computer model, dopamine, dopamine system, extrapyramidal system, haloperidol, theoretical aspects, 3328
- muscle fiber, tissue culture, voltage clamp, in vitro, chicken, 92
- achilles reflex**, analog computer, tendon reflex, time measurement, photomogram, 1619
- acid**, base, bilayer membrane, economics, engineering, 3491
- acid base balance**, blood gas, computer, information processing, 3412
- blood gas, blood sampling, syringe, b109 syringe, 2920
- acid phosphatase**, automation, serum, 1171
- acoustic impedance**, brain stem, neurootology, pons angle tumor, stapes reflex, diagnostic value, 1683
- erythrocyte, kidney, liver, muscle, sound velocity, tissue, ultrasonics, viscosity, shear acoustic impedance, 58
- mathematic model, tympanometry, acoustic admittance, w notch, 3518
- acoustic localization**, apparatus, tracking pointer, display, 2990
- acoustic nerve**, cochlea, electrode, electrostimulation, scala tympani, nerve survival, stimulation pattern, cat, 3339
- hearing, mathematic model, vision, photo counter, 3157
- hearing, information processing, nerve potential, goldfish, 3346
- hearing, nerve potential, two tone stimulus, 2441
- nerve potential, summed action potential, locusta, 1330
- acoustic nerve neurinoma**, brain infarction, brain tumor, computer assisted tomography, posterior cranial fossa tumor, 191 cases, 3835
- chordoma, computer assisted tomography, hypophysis adenoma, skull base, 801
- cisternography, computer assisted tomography, metrizamide, neurinoma, pons angle tumor, 10 cases, 3841
- cochleography, meniere disease, differential diagnosis, 439 cases, 3337
- acoustic reflex**, auditory threshold, growth function, 3347
- hearing, loudness discrimination, tympanic membrane impedance, 899
- tympanometry, 80 cases, 2985
- acrylic acid**, bone cement, porous cement, 385
- bone cement, fracture, stress fracture, fracture characteristics, 1624
- femur, prosthesis, stress, total hip prosthesis, charnley prosthesis, 2261
- acrylic acid resin**, porcelain, wear test, 3486
- acrylonitrile**, biocompatibility, blood, thrombocyte, structure, 383
- actin**, actomyosin, adenosine triphosphatase, calcium, model, muscle, myosin, quantitative model, 890
- adenosine triphosphatase, model, muscle, myosin, troponin, 48
- actin f**, muscle contraction, thermodynamics, elastic modulus, actin actin bond strength, thermodynamics, conformational change, 1267
- action potential**, fourier transform, heart rate, information processing, point process, 71
- heart muscle fiber, heart ventricle, mathematic model, voltage clamp, 938
- histogram, microelectrode, window discriminator, time amplitude discriminator, 2238
- muscle, muscle fiber membrane potential, human, muscle anisotropy, 2462
- active filter**, all pass filter, 3577
- band pass filter, 515
- circuit design, semiconductor, CMOS active-R filter, 2101
- low pass filter, 3578
- notch filter, operational amplifier, 112
- notch filter, 1765
- notch filter, parallel t filter, 1761
- operational amplifier, 514
- selective amplifier, 1763
- selective amplifier, 2484
- switch, 513
- 2100
- frequency capability, 516
- digital control, 111
- actomyosin**, actin, adenosine triphosphatase, calcium, model, muscle, myosin, quantitative model, 890
- acupuncture**, hypnosis, pain, signal detection theory, 12 volunteers, report criterion, 1079

- impedance, laplace analysis, 1746
- laser, rheumatic disease, akuplas device, 2898
- microsystem, 318
- physiology, 1493
- acute abdomen**, abdominal pain, computer, computer assisted diagnosis, 1537 patients, diagnosis, 1161
- acute lymphatic leukemia**, SEE acute lymphoblastic leukemia
- acute lymphoblastic leukemia**, B lymphocyte, computer, data base, T lymphocyte, clinfo, 2365
- acute pancreatitis**, chronic pancreatitis, computer assisted tomography, pancreas cancer, 121 cases, 820
- adaptation**, movement perception, differential sensitivity, 554
- adaptometry**, dark adaptation, night vision, new device, 3342
- ad converter**, amplifier, 3608
 - amplifier, attenuator, 2486
 - automation, information processing, laboratory, microprocessor, multiplexer, modules marketing, 2519
 - averaging, error, 2515
 - computer interface, digital computer, image processing, scintigraphy, scintillation camera, 3014
 - interference suppression, signal noise ratio, 3605
 - speech, 651
- adenosine**, adenosine triphosphate, adenylcyclase, computer model, coronary artery blood flow, cyclic amp, heart muscle ischemia, hypoxanthine, inosine, noradrenalin, rat, 872
- adenosine diphosphate**, adenosine triphosphate, model, muscle contraction, quantum theory, sliding filament theory, transducer, quantum mechanical transducer model, 2033
- adenosine triphosphatase**, actin, actomyosin, calcium, model, muscle, myosin, quantitative model, 890
 - actin, model, muscle, myosin, troponin, 48
 - adenosine triphosphate, energy transfer, mathematic model, 3495
 - amnesia, cycloheximide, lithium chloride, memory, ouabain, phenytoin, potassium chloride, protein synthesis, sodium pump, 3 phase model, 241
 - circular dichroism, heart failure, heart muscle, myosin, electron microscopy, dog, 632
 - computer model, glycogenolysis, glycolysis, heart perfusion, hypoxia, lactate permease, rat, 2170
 - heart muscle contraction, mathematic model, mathematical model, 2424
- adenosine triphosphate**, adenosine, adenylcyclase, computer model, coronary artery blood flow, cyclic amp, heart muscle ischemia, hypoxanthine, inosine, noradrenalin, rat, 872
 - adenosine diphosphate, model, muscle contraction, quantum theory, sliding filament theory, transducer, quantum mechanical transducer model, 2033
 - adenosine triphosphatase, energy transfer, mathematic model, 3495
 - calcium, cell membrane, cell membrane permeability, model, sodium, transport mechanism, 2011
 - calcium pump, cell membrane, sarcoplasmic reticulum, 405
 - colchicine, cytoplasm, protoplasm streaming, nitella flexilis, 1626
 - erythrocyte, glycolysis, mathematic model, human erythrocyte, 3116
 - filament, muscle contraction, myosin, sliding filament theory, molecular mechanism, 444
 - model, muscle contraction, cross bridge model, 3142
- adenylcyclase**, adenosine, adenosine triphosphate, computer model, coronary artery blood flow, cyclic amp, heart muscle ischemia, hypoxanthine, inosine, noradrenalin, rat, 872
 - computer model, cyclic amp, heart muscle ischemia, hypoxanthine, inosine, noradrenalin, phosphodiesterase, vasodilatation, rat, 2452
- adenylosuccinate synthetase**, isoenzyme, liver, rat, 2128
- adhesion**, chromium 51 labelled lymphocyte, lymphocyte, mathematic model, T lymphocyte, rat, lymphocyte adhesion, 8
- adhesive agent**, epidermis horny layer, transparency, transparency patterns, adhesive tape strip series, apparatus, 3006
- administration**, computer, information processing, medical record, nuclear medicine, france, nancy, 2749
 - finance, minicomputer, patient care, medium scale computer converting to mini, 2875
- adrenal cancer**, computer assisted tomography, kidney anomaly, kidney cancer, survey, 3071
- adrenal gland**, chemical kinetics, corticotropin, model, 2183
- adsorbent agent**, artificial organ, compartment model, perfusion, fixed bed adsorber, 2059
- adverse drug reaction**, computer, medical literature, bibliometry, bibliometric analysis, 2371
 - computer, drug monitoring, lyons civil hospital, 1572
 - computer, information processing, monitoring, 3059
 - drug monitoring, epidemiology, mathematic model, pattern recognition, pharmacokinetics, public health, 1956
- aerosol**, air blood barrier, lung alveolus, radioactive aerosol, alveolar microenvironment, review, 648
 - air pollution, atmosphere, laser, lidar, 403
 - air sampling, occupational safety, protective equipment, personal sampling pumps review, 3748
 - asepsis, bacterial pollution, bronchial asthma, fungus, infection, risk, 27 apparatuses, 18 subjects, mobile use, 1478

- dust, industrial hygiene, particle counter, portable optical counter system, 3413
- aerospace medicine**, aviation, ophthalmology, vision, visual field, space studying device, flight simulation, 3368
- afterimage**, prism, wilkinson model, 2569
- age**, aorta strip, aorta wall, collagen, elasticity, thoracic aorta, human, 59-82 yr, 44
 - arthritis, arthrosis, rheology, sex, synovial fluid, human, 3519
 - auditory threshold, hearing, hearing impairment, noise pollution, population research, 684
 - bekesy audiometry, bone conduction, stapes, automatic audiometry, grason stadler bekesy audiometer, 3480
 - biomechanics, sex, skin, living skin, tension extension ratio, human, 1910
 - brain cortex, computer assisted tomography, hemianopia, hemiparesis, partial epilepsy, temporal lobe epilepsy, 11 out of 500 children, 788
 - brain sulcus, brain ventricle, computer assisted tomography, third brain ventricle, cella media, 100 normal adults, 3443
 - brain ventricle, computer assisted tomography, sex, 170 examinations, age, sex, 3444
 - breast cancer, cancer incidence, cancerogenesis, epidemiology, menarche, menopause, stochastic model, 2768
 - catastrophe, population model, age group elimination, 5
 - cerebellum atrophy, computer assisted tomography, lennox gastaut syndrome, 38 cases, etiology, 2735
 - closed angle glaucoma, computer, glaucoma, open angle glaucoma, prevalence, 1231
 - deafness, hearing, age dependence, 53
 - femur shaft, sex, structure strength, 37 human, 892
- aged**, brain hematoma, brain infarction, brain tumor, cerebrovascular accident, computer assisted tomography, stroke, subdural hematoma, diagnostic value, 3830
- aggression**, behavior, mathematic model, predator prey communities, 14
- agriculture**, chelating agent, food chain, penthanil, plant, plutonium 239, radioactive contamination, pu 239 uptake, usa, 95
- air**, argon, bubble, gas exchange, nitrogen, bubble formation measurement, 1348
 - environmental monitoring, occupational exposure, radioactive contamination, radon 222 daughter, workroom air, working level, 2904
- air blood barrier**, aerosol, lung alveolus, radioactive aerosol, alveolar microenvironment, review, 648
- aircraft**, automation, aviation, ergonomics, u.k., 3039
 - man machine interaction, model, pilot, 3503
- aircraft accident**, computer model, computer program, injury, calspan gross motion simulation code, digital computer simulation, 2649
- air flow**, air velocity, manometry, strain gauge transducer, bell manometer, 152
 - analog computer, expiration, inspiration, integrator, lung volume, respiration, drift suppression, 2377
 - flowmeter, turbine, 3232
 - mouth, pneumotachygraphy, speech, measurement of airflow, 654
 - respiration, respiratory flowmeter, calibration, 1482
 - ionised air, 2537
- air flowmeter**, airway obstruction, bronchial asthma, forced expiration, histamine, simple device, 3710
 - artificial ventilation, monitoring, turbulent flow, 655
 - forced expiratory volume, lung function test, device, 2607
- airplane pilot**, biodynamics, mathematic model, model, parachutist, ucin crash victim simulation code, wind loading effect, 3364
 - body posture, hand, head, instrument panel, vibration, fighter bomber, lumped parameter biomechanical model, 3366
 - ejection seat, emergency, mathematic model, model, body model, windblast force, aerodynamic force, articulated human body, emergency ejection, 2648
 - model, performance, optimal control pilot vehicle model, roll motion effect, 3367
- air pollution**, aerosol, atmosphere, laser, lidar, 403
 - anesthetic gas, automotive exhaust, operating room, workroom air, scavenging system, 1932
 - atmosphere, laser, vision, 1252
 - atmosphere, environment, microwave radiation, sulfur dioxide, 1873
 - carbon monoxide, hydrochloric acid, hydrofluoric acid, infrared radiation, nitrogen oxide, sulfur dioxide, 233
 - conductivity, sulfur dioxide, hydrogen peroxide, temperature correction, 3680
 - correlation function, digital computer, spectrometry, 1872
 - digital computer, fluorescence, multichannel analyzer, roentgen radiation, serum, 3277
 - electronics, traffic, future development, 1476
 - environment, infrared radiation, light absorption, spectrometry, 2150
 - environment, ethylene, lidar, 2612
 - environment, model, pollution monitoring, 2955
 - environment, laser, monitoring, digital system, 1480
 - environment, information processing, lidar signal, 2578

- fourier transform, spectrometry, infrared radiation, 3654
- hospital, odor, olfactometry, emission analysis, 992
- microwave radiation, spectrometry, stark spectrometer, 3661
- air sampling**, aerosol, occupational safety, protective equipment, personal sampling pumps review, 3748
 - atmospheric radioactivity, filter, radon daughter, filter efficiency, 1337
 - dust, filter, dust loading characteristics, high inertial fibrous filters, 2863
 - industrial hygiene, calibration manifold, 2266
- air velocity**, air flow, manometry, strain gauge transducer, bell manometer, 152
- airway**, airway resistance, bronchus tree, entropy, lung vascular resistance, mathematic model, respiration, morphology, branching tree, 434
 - ciliary motility, mathematic model, human airway lengths, 3109
 - elastic tube, forced expiratory volume, lung compliance, tube flow, wave speed theory, 1714
 - flow, lung compliance, lung volume, tube, wave speed limitation, unifying concept, 1713
 - lung compliance, lung elasticity, model, respiration, flow limiting segment, 442
- airway impedance**, breathing, lung impedance, lung pressure, healthy man, 3304
- airway obstruction**, air flowmeter, bronchial asthma, forced expiration, histamine, simple device, 3710
 - endotracheal intubation, pollard tube, 2 cases, 324
 - polyvinylchloride, trachea tube, polyvinyl chloride tube, obstruction, 1543
- airway resistance**, airway, bronchus tree, entropy, lung vascular resistance, mathematic model, respiration, morphology, branching tree, 434
 - body plethysmography, computer, total lung volume, manual vs automated method, 231
 - breathing mechanics, breathing muscle, breathing work, mathematic model, force velocity relationship, 1271
 - breathing mechanics, lung compliance, measurement device, 2217
 - lung elasticity, lung model, mathematic model, nonlinear model, 441
 - plethysmography, total lung volume, measurement apparatus, infant, 1935
- alamethicin**, autocorrelation, lipid membrane, membrane permeability, membrane potential, power, multi pore system, autocorrelation analysis, power spectral density, 3549
 - lipid membrane, membrane potential, voltage clamp, multipore system, multi pore system, voltage jump current relaxation measurement, 3174
- alarm monitoring**, artificial ventilation, ventilator, bennet, 3312
 - artificial ventilation, monitoring, respiration, device, 2606
 - artificial ventilation, positive end expiratory pressure, 746
 - computer, heart arrhythmia, computerized arrhythmia alarm system, 780
 - computer, electrocardiography, heart infarction, heart ventricle arrhythmia, 2 computer programs comparison, 1568
 - computer, heart arrhythmia, 3428
 - coulter counter, audible reject alarm, counter s, 625
 - enuresis, inexpensive low current circuit, 3321
- alcian blue**, microelectrode, nerve cell, electrode tip labelling, cat, 1886
- alcoholism**, alzheimer disease, brain atrophy, computer assisted tomography, dementia, multiple sclerosis, parkinson disease, progressive multifocal leukoencephalopathy, schilder disease, survey, 358
 - amyotrophic lateral sclerosis, anterior tibial muscle, biceps brachii muscle, electromyography, motoneuron disease, muscular dystrophy, polyneuropathy, muaps, automatic analysis, 14 controls, 11 cases, 857
- aldosterone**, angiotensin, blood volume, computer model, kidney function, vasopressin, 1311
 - correlation function, corticosterone, hydrocortisone, plasma renin activity, 1654
- alertness**, computer, electroencephalography, electromyography, 5 hydroxytryptophan, levodopa, rem sleep, sleep spindle, stage 3 sleep, automatic classification, cat, 1620
 - computer, electroencephalography, electromyography, rem sleep, sleep, telemetry, rat, automatic analysis, 2111
- algorithm**, artificial intelligence, information science, fuzzy algorithm, 2524
 - breathing mechanics, calculator, computer, programmable calculator, 2378
 - cancer chemotherapy, drug dose, hodgkin disease, pharmacotherapy, oncology center, 351
 - coding, computer, thyroid function test, 2305
 - computer, electrocardiography, mathematic model, qrs complex, vectorcardiography, wave recognition algorithm, chest, 3180
 - computer assisted diagnosis, decision, decision theory, diagnosis, 336
 - computer assisted tomography, fourier transform, image processing, 2342
 - computer program, laboratory automation, microprocessor, process control, 2692
 - correlation function, 878
 - correlation function, factorial analysis, parameter, matrix analysis, 3511
 - digital computer, medical record, outpatients, 3084
 - digital computer, heart output, stewart hamilton method, 2064

- digital filtering, fourier transform, fast fourier transform, 2529
- digital filtering, filter synthesis, 543
- electroencephalography, epilepsy, analysis, 347
- electromyography, lip, speech, analysis, synthesis, manipulation, feature, 1985
- fourier transform, image processing, 3514
- image processing, signal noise ratio, vision, visual resolution, 1925
- image processing, smoothing algorithm, 2674
- pitch, speech, evaluation, 906
- modified orthogonal tangent correction, 342
- alkaline phosphatase isoenzyme**, bone, intestine, radiation injury, whole body radiation, biologic dosimetry, rat, 1162
- all pass filter**, active filter, 3577
- alpha rhythm**, artifact, automation, delta rhythm, drowsiness, electroencephalography, theta rhythm, 31 subjects, artifact rejection, 1947
 - averaging, evoked cortical response, evoked visual response, alpha removal, 1998
 - beta rhythm, computer, electroencephalography, mu rhythm, analysis, 500 eeg's, 1570
 - beta rhythm, computer, delta rhythm, electroencephalography, theta rhythm, 306 subjects, normal value, computer analysis, 2705
 - biofeedback, electroencephalography, statistical properties, 6 volunteers, 83
 - brain depth recording, electroencephalography, 81
 - computer, electroencephalography, multichannel recorder, rem sleep, sleep, 10 subjects, automation, 2706
 - electroencephalography, recognition method, 556
- alternating current**, electrocardiography, interference, interference suppression, monitoring, removal of ac current interference, 2133
- althesin**, brain blood flow, brain ischemia, brain scintigraphy, computer assisted tomography, xenon 133, 158 cases, 2730
- aluminum**, brems radiation, roentgen apparatus, 60-140 kv, 725
- aluminum oxide**, ceramics, polyethylene, total hip prosthesis, tribologic aspects, 1622
 - conductivity, radiography, 3202
- aluminum silicate**, biocompatibility, serum protein, teflon, thrombocyte adhesiveness, 2001
- alzheimer disease**, alcoholism, brain atrophy, computer assisted tomography, dementia, multiple sclerosis, parkinson disease, progressive multifocal leukoencephalopathy, schilder disease, survey, 358
- amblyopia**, computer, eye movement, strabismus, binocular vision, motility testing, 3485
- ambulance**, army, helicopter, mobile emergency life support, special training, denmark, 606
 - emergency, heart infarction, life support system, telemetry, 3292
 - emergency health service, helicopter, rescue personnel, german federal republic, equipment, 5 yrs experience, ulm, 3569
- ambulatory care**, computer, medical record, nurse, 837
 - computer, cost benefit analysis, information processing, medical record, combined with manual techniques, indianapolis, 1609
- amelia**, arm prosthesis, congenital malformation, powered prosthesis, arm absence, shoulder absence, case report, 707
- americium**, fluorescent scanning, iodine, gamma radiation, thyroid gland, concentric source detector design, 308
- aminoacid**, chromatography, electrophoresis, skin, thin layer chromatography, urea, method, device, 3746
- s (2 aminoethyl) isothiuronium**, lifespan, mortality, radiation dose fractionation, whole body radiation, mouse, 2903
- ammonium**, aspartate aminotransferase blood level, brain edema, computer, electroencephalography, encephalopathy, exchange blood transfusion, fatty liver, furosemide, mannitol, reye syndrome, 7 children, 779
 - membrane potential, sodium chloride, voltage clamp, electric resonance, 1720
- ammonium derivative**, electric resistance, lipid membrane, tetrapentyl ammonium cation model, theoretical aspects, bilayer membrane, in vitro, 560
- amnesia**, adenosine triphosphatase, cycloheximide, lithium chloride, memory, ouabain, phenytoin, potassium chloride, protein synthesis, sodium pump, 3 phase model, 241
- amniocentesis**, needle, spring loaded amniocentesis needle, 1144
- amnion fluid**, amnion sac, drug distribution, drug metabolism, fetus, placenta transfer, guinea pig, rabbit, gottinger miniature pig, intraamniotic application method, intraamniotic administration, 3717
 - breathing mechanics, echography, fetus, lung, time distance recorder, 2163
- amnion sac**, amnion fluid, drug distribution, drug metabolism, fetus, placenta transfer, guinea pig, rabbit, gottinger miniature pig, intraamniotic application method, intraamniotic administration, 3717
- amplifier**, ad converter, 3608
 - ad converter, attenuator, 2486
 - bolometer, electromagnetic radiation, signal noise ratio, 2147
 - cooling, radioreceiver, signal noise ratio, 1762

- counter, counting, preamplifier, 955
- cryogenics, fet semiconductor, microwave radiation, signal noise ratio, 107
- cryogenics, nuclear magnetic resonance, signal noise ratio, 2153
- cryogenics, charge amplifier, 952
- current amplifier, operational amplifier, impedance converter, 1352
- current meter, 517
- electrocardiography, electroencephalography, electromyography, optoelectronic transducer, 2099
- electroencephalography, electromyography, interference, telemetry, powerline interference, 1362
- implantation, ph electrode, thick film hybrid technology, 2143
- manometry, pressure transducer, strain gauge transducer, 1376
- microelectrode, high impedance amplifier, input capacitance neutralization, 1759
- nuclear radiation, pulse amplifier, 2864
- ph electrode, automatic balancing amplifier, 1760
- photodiode, signal noise ratio, 518
- photodiode, signal noise ratio, feedback, 1410
- television, 532
- 109
- amplitude modulator**, frequency modulation, generator, telemetry, 3585
 - hearing, noise, pure tone audiometry, tone roughness, 56
 - hearing, pitch perception, nonspectral pitch, noise stimulus, 1087
 - phase modulator, telemetry, 2113
 - telemetry, coherent quaternary modulation, phase modulation, 121
- amygdaloid nucleus**, electroencephalography, kindling, mathematic model, first approximation model, 2475
- amyotrophic lateral sclerosis**, alcoholism, anterior tibial muscle, biceps brachii muscle, electromyography, motoneuron disease, muscular dystrophy, polyneuropathy, muaps, automatic analysis, 14 controls, 11 cases, 857
- analog computer**, achilles reflex, tendon reflex, time measurement, photomotogram, 1619
 - air flow, expiration, inspiration, integrator, lung volume, respiration, drift suppression, 2377
 - computer memory, signal processing, delay line, ccd, 984
 - computer memory, information processing, 2119
 - correlation function, spectrometry, 2517
 - differential amplifier, 3604
 - differentiation, low frequency differentiator, 2120
 - digital computer, heart catheterization, hemodynamics, information processing, mini computer, 1990
 - hybrid computer, standards, 2384
 - hypophysis, hypothalamus, thyroid gland, thyrotropin, thyroxine, simulator, 1148
 - integrator, grounded capacitor, 3603
 - integrator, 1790
- analog digital converter**, computer memory, digital filtering, read only memory, 1373
 - 3610
 - fast conversion, 2126
- analog model**, artery flow, mathematic model, 918
 - bone marrow, mathematic model, 3282
- anatomy**, cell structure, embryogenesis, gastrulation, mathematic model, tissue, 3510
- anemia**, computer assisted diagnosis, computer teaching, hematology, model, computer vs non computer, france, 2690
- anemometry**, doppler ultrasound flow meter, laser, 154
 - droplet size, laser, 3612
 - environment, hot wire, calibration, 3624
 - hot wire anemometry, thermometer, 546
 - respiration, thermistor, shunted sensor, 1871
 - 3 dim anemometer, 1385
 - vortex anemometer, 551
- anesthesia**, anesthetic equipment, head, inhalation anesthesia, head enclosure, monkey, 1545
 - anesthetic equipment, body temperature, heated operating board, 3030
 - artificial ventilation, ventilator, standard adult equipment, rat, 653
 - artificial ventilation, brain depth recording, positive pressure ventilation, small animals, rat, 1484
 - artificial ventilation, digital system, ventilator, digital control, 1547
 - blood pressure, feedback system, halothane, 3 patients, 1134
 - body, electrostatic charge, explosion hazard, capacitance measurement, human body, 1390
 - brain, electroencephalography, intensive care, monitoring, 2676
 - computer, electroencephalography, frequency analyzer, hypoxia, microprocessor, minicomputer, monitoring, display system, cerebral function analyzer monitor, 3805
 - computer, repetitive task processing, 378

- computer, medical record, vs man made record, 758
- cost, heart arrest, lung function, medical record, monitoring, operating room, techniques, requirement, 3032
- endotracheal intubation, rabbit intubation, improved method, 3305
- monitoring, nitrous oxide, oxygen consumption, surgery, oxygen measurement, 1934
- anesthesia complication**, anesthetic equipment, 3031
- anesthesia induction**, anesthetic equipment, aspiration, prevention, 3029
- anesthesiology**, automotive exhaust, hospital, operating room, scavenging system, mechanical aspects, 3393
 - recording, tape recorder, 2289
- anesthesist**, heart rate, hospital personnel, mental load, operating room, stress, telemetry, 525
- anesthetic agent**, blood chemistry, blood pressure, computer, electroencephalography, monitoring, open heart surgery, temperature, patient monitoring system, 350
- anesthetic equipment**, anesthesia, head, inhalation anesthesia, head enclosure, monkey, 1545
 - anesthesia, body temperature, heated operating board, 3030
 - anesthesia complication, 3031
 - anesthesia induction, aspiration, prevention, 3029
 - artificial ventilation, mapleson d system, 323
 - automotive exhaust, child anesthesia, scavenger, waste gases see exhaust gases, 1136
 - child anesthesia, new system, 1933
 - endobronchial intubation, white tube modification, 2950
 - flowmeter, gapmeter tap kit, 747
 - obstetric anesthesia, portable apparatus, 1546
- anesthetic gas**, air pollution, automotive exhaust, operating room, workroom air, scavenging system, 1932
- anesthetic recovery**, outpatient, stabilography, measurement, 3394
- aneurysm**, endoscopy, hypophysis adenoma, lumbar disk, sella turcica, telescope, endoscopy, apparatus, neurosurgery, hopkins telescope, 666
 - hemodynamics, model, fusiform model, 474
 - hemodynamics, model, 468
- angina pectoris**, heart muscle, image processing, infarction, radioisotope, thallium 201, 2287
- angiocardiology**, angiography, computer, information processing, 3463
 - artificial heart pacemaker, data base, decision, minicomputer, 3095
 - brachial artery, catheter, heart catheterization, 700 cases, 3018
 - catheter, embolism, heart catheterization, thrombosis, pigtail catheter, different sideholes numbers, catheter comparison, 3754
 - heart surgery, sternum retractor with radiolucent blades, 1145
 - left coronary artery, modification of philips cradle, 735
 - left coronary artery, longitudinal angulation, 100 examinations, 2268
- angiography**, angiocardiology, computer, information processing, 3463
 - artery occlusion, artificial embolism, balloon catheter, micro balloon catheter, 220
 - blood flow, magnetorheography, rheology, dog, 3753
 - blood vessel, image processing, methods comparison, 737
 - blood vessel, computer model, phantom, 1862
 - blood vessel injury, brain, decision theory, 1222
 - brain angiography, computer assisted tomography, superior mesenteric angiography, method, case series, 1205
 - cast, elasticity, heart left ventricle, heart muscle, mathematic model, urethan, calculation of young's elastic modulus, 433
 - computer, image processing, x ray film, system, 3840
 - contrast intensification, wedge filter, 3024
 - injection, power injector, 721
- angiotensin**, aldosterone, blood volume, computer model, kidney function, vasopressin, 1311
- angle measurement**, zero angle meter, 1122
- angle transducer**, joint, linearity, 1757
- angular acceleration**, computer model, vestibular system, vestibuloocular reflex, white noise, computer simulation, cross correlation analysis, white noise input, cat, 1286
- aniseikonia**, astigmatism, binocular vision, refraction, retina correspondence, retina image, problem of distortion, 2988
- anisotropy**, aorta strip, artery, mathematic model, viscoelasticity, dog, 1675
 - heart muscle membrane potential, mathematic model, membrane potential, muscle, nerve, syncytium, dog, 3184
 - photolysis, retina rod, retina rod outer segment, rhodopsin, frog, 698
- ankle**, anterior tibial muscle, electromyography, foot, gastrocnemius muscle, joint, rotation, soleus muscle, sinusoidal torque, human, 895
 - biomechanics, muscle strength, strength duration curve, tibialis anterior muscle, model, dog, 287

- fracture external fixation, joint mobility, osteosynthesis, physiotherapy, rehabilitation, talipes equinus, tibia fracture, foot movement plate, 3742
- ankylosing spondylitis**, cauda equina, computer assisted tomography, myelography, case report, man of 68, 3074
- annoyance**, community, environmental sanitation, loudness, noise, perception, pollution, loudness scaling, 256
- anorectal pressure**, anus, anus continence, constipation, rectum pressure, portable 3 channel unit, 210
- antenna**, brain depth stimulation, chemotherapy, microwave radiation, radiation hazard, stereotaxis, 2172
 - coaxial cable, telemetry, tunnel, 3220
 - electromagnetic field, satellite, telemetry, 2107
 - electromagnetic radiation, telemetry, beam profile, yagi antenna, 3586
 - implant, telemetry, 1771
 - microwave radiation, radiation hazard, avoidance, 1011
 - signal noise ratio, telemetry, 964
 - telemetry, automatic antenna selector, 527
 - telemetry, dipole characteristic, 3584
 - telemetry, cylindrical antenna, 962
- anterior eye chamber**, photometry, tyndall phenomenon, new device, 2555
- anterior tibial muscle**, alcoholism, amyotrophic lateral sclerosis, biceps brachii muscle, electromyography, motoneuron disease, muscular dystrophy, polyneuropathy, muaps, automatic analysis, 14 controls, 11 cases, 857
 - ankle, electromyography, foot, gastrocnemius muscle, joint, rotation, soleus muscle, sinusoidal torque, human, 895
- anthropometry**, computer, program, health carter somatotype calculation, 3094
 - joint, knee, scaling method, 1524
- antibiotic agent**, antibody production, antigen antibody reaction, delayed hypersensitivity, immune response, mathematic model, 3114
 - bacteriology, digital computer, autobac, ms2, abac, 3799
 - bone cement, oxacillin, poly(methacrylic acid methyl ester), high pressure insertion, 2
- antibiotic sensitivity**, computer, drug sensitivity, information processing, 331
- antibody affinity**, antibody production, antigen antibody reaction, immunization, mathematical theories, epidemic, 2777
- antibody production**, antibiotic agent, antigen antibody reaction, delayed hypersensitivity, immune response, mathematic model, 3114
 - antibody affinity, antigen antibody reaction, immunization, mathematical theories, epidemic, 2777
- anticoagulant agent**, computer assisted tomography, femoral neuropathy, retroperitoneal hematoma, 2 case reports, 3060
 - computer program, dose response, thrombosis, long term control, 1172
- antigen antibody reaction**, antibiotic agent, antibody production, delayed hypersensitivity, immune response, mathematic model, 3114
 - antibody affinity, antibody production, immunization, mathematical theories, epidemic, 2777
 - automation, immunoassay, turbidimetry, 756
- antigen protein**, chemical kinetics, enzyme, ribonuclease, ribonucleic acid, ultrasonics, ultrasonic cavitation, 203
- antigravity suit**, blood pressure, trousers, pressure support, 3293
- antihypertensive agent**, computer, hypertension, physician, prospective controlled study, 116 patients, 849
- antilymphocyte serum**, HL A antigen, lymphocyte, tissue typing, command processor, 2297
- antimony**, bicarbonate, buffer, carbon dioxide, carbon dioxide tension, hydrogen ion, microelectrode, oxygen tension, antimony microelectrode, 165
- anus**, anorectal pressure, anus continence, constipation, rectum pressure, portable 3 channel unit, 210
- anus continence**, anorectal pressure, anus, constipation, rectum pressure, portable 3 channel unit, 210
- anxiety**, biofeedback, electromyography, epilepsy, insomnia, paralysis, spasticity, tension headache, clinical application, review, 1081
- aorta**, aorta valve prosthesis, heart left ventricle, mitral valve prosthesis, model, flow visualization, 920
 - artery flow, blood flow, blood vessel, carotid artery, doppler ultrasound flow meter, femoral artery, transcutaneous vs implanted cuff, 224
 - artery wall compliance, plethysmography, thoracic aorta, measurement, modeling, dog, 2598
- aorta balloon**, aorta pressure, assisted circulation, blood vessel resistance, heart output, hydraulic power, dog, 1859
 - aorta valve prosthesis, assisted circulation, cardiovascular system, korotkow sound, simulator, design, performance, 2177
 - artery counter pulsation, assisted circulation, computer, electrocardiography, trigger, optimum performance determination, 3098
 - heart output, increased heart output, downstream pumping, reversed unidirectional intra aortic balloon, dog, 1454
- aorta flow**, blood flow, flow probe, probe placement device, 3297

- capillary flow, circulation, model, vein blood flow, 919
- densitometry, 3696
- electromagnetic flowmeter, heart output, automatic zeroing base line circuit, 1801
- aorta pressure**, aorta balloon, assisted circulation, blood vessel resistance, heart output, hydraulic power, dog, 1859
- aorta stenosis**, abdominal aorta coarctation, artery pulse, blood flow, blood pressure, dog, reflection of pressure and flow waves, 471
 - aorta valve disease, aorta valve regurgitation, computer, electrocardiography, heart left ventricle hypertrophy, vectorcardiography, 257 patients, 2323
 - aorta wall, mathematic model, turbulent wall pressure measurement, 1711
 - artery wall compliance, hemodynamics, mitral valve regurgitation, model, hydraulic model, factors affecting transvalvar pressure, gorlin formula, 917
- aorta strip**, age, aorta wall, collagen, elasticity, thoracic aorta, human, 59-82 yr, 44
 - anisotropy, artery, mathematic model, viscoelasticity, dog, 1675
- aorta subvalvular stenosis**, cardiography, computer, echography, mitral valve prolapse, mitral valve stenosis, pattern recognition, 3102
- aorta surgery**, aorta valve prosthesis, ascending aorta, blood flow, extracorporeal circulation, mitral valve prosthesis, flowmetry, 2207
- aorta valve**, aorta valve homograft, elasticity, frozen aorta valve homografts, freezing methods, cadaver graft, 431
 - heart valve leaflet, stress, geometrical data, human valve, 1268
 - heart valve prosthesis, subcoronary ball valve, early experiments, 1842
- aorta valve disease**, aorta stenosis, aorta valve regurgitation, computer, electrocardiography, heart left ventricle hypertrophy, vectorcardiography, 257 patients, 2323
- aorta valve homograft**, aorta valve, elasticity, frozen aorta valve homografts, freezing methods, cadaver graft, 431
- aorta valve prosthesis**, aorta, heart left ventricle, mitral valve prosthesis, model, flow visualization, 920
 - aorta balloon, assisted circulation, cardiovascular system, korotkow sound, simulator, design, performance, 2177
 - aorta surgery, ascending aorta, blood flow, extracorporeal circulation, mitral valve prosthesis, flowmetry, 2207
 - computer, phonocardiography, dysfunction detection, 769
 - heart valve prosthesis, aorta left ventricle pulse duplicator, chest model, 643
 - avcothane 51 leaflet, design, 1856
- aorta valve regurgitation**, aorta stenosis, aorta valve disease, computer, electrocardiography, heart left ventricle hypertrophy, vectorcardiography, 257 patients, 2323
 - echocardiography, pulse doppler, 65 cases, 599
- aorta wall**, age, aorta strip, collagen, elasticity, thoracic aorta, human, 59-82 yr, 44
 - aorta stenosis, mathematic model, turbulent wall pressure measurement, 1711
- aortofemoral bypass graft**, catheter, celiac trunk angiography, dacron, percutaneous selective angiography, case report, 3382
- aortography**, abdominal aortography, catheter, catheter with multiple side holes, 736
 - femoral artery, peripheral occlusive artery disease, transaxillary aortography, special catheter, 230 cases, 720
- aphakia**, cornea transplantation, intraocular pressure, mathematic model, trabecular meshwork, 2800
- aphasia**, automation, evoked cortical response, localization method, 3104
 - brain infarction, computer assisted tomography, embolism, medial brain artery, stroke, 60 cases, 1195
 - neurolinguistics, model, 1077
- apnea**, bradycardia, microprocessor, monitoring, infant, 2715
- apomyoglobin**, fluorescence, fast decay measurement, 176
- applanation tonometry**, glaucoma, intraocular pressure, tonometry, 2 new types, patients, normal subjects, 2247
 - intraocular pressure, accuracy, comparative study, 141 eyes, 2995
 - intraocular pressure, for the dog eye, calibration, 2242
- aqueous humor**, intraocular pressure, minicomputer, ophthalmology, xenon 133, pdp 8 e, cat, 3481
- aqueous humor outflow**, glaucoma, iridectomy, laser, required energy, 2249
- arachnoiditis**, brain artery aneurysm, brain hemorrhage, computer assisted tomography, subarachnoid hemorrhage, 8 cases, 1578
- araldite**, embedding, hair, cross sectioning, 294
- argon**, air, bubble, gas exchange, nitrogen, bubble formation measurement, 1348
 - dosimetry, heavy particle radiation, tissue equivalent, 726
- argon 37**, breath analysis, calcium, xenon 133, recirculating breath collection system, effect on exhalation rate, 3640
- argon laser**, gastrointestinal hemorrhage, gastroscopy, laser, stomach ulcer, dogs, device, treatment, 3274
 - hemangioma, spider nevus, 17 lesions in 16 patients, 2897

arm prosthesis, above knee prosthesis, powered prosthesis, research program, 288

- amelia, congenital malformation, powered prosthesis, arm absence, shoulder absence, case report, 707
- blood pressure, digital computer, electroencephalography, heart catheterization, microprocessor, monitoring, prosthesis, 2685

army, ambulance, helicopter, mobile emergency life support, special training, denmark, 606

arnold chiari malformation, computer assisted tomography, metrizamide, myelography, syringomyelia, 20 cases, 3765

arterial carbon dioxide tension, arterial oxygen tension, gas analysis, gas chromatography, continuous measurement, gas chromatographic catheter, 563

- arterial oxygen tension, carbon dioxide electrode, mass spectrometry, oxygen tension electrode, venous oxygen tension, continuous measurement, 3632
- breathing, lung ventilation, tidal volume, time series, cluster analysis, dog, 2954

arterial oxygen tension, arterial carbon dioxide tension, gas analysis, gas chromatography, continuous measurement, gas chromatographic catheter, 563

- arterial carbon dioxide tension, carbon dioxide electrode, mass spectrometry, oxygen tension electrode, venous oxygen tension, continuous measurement, 3632
- monitoring, multi sensor support, 2139
- monitoring, newborn, oxygen tension electrode, skin oxygen tension, 3633
- 561
- transcutaneous measurement, device, 1811

arteriography, arteriotomy, brachial angiography, brachial artery, brain atherosclerosis, carotid artery, heart catheterization, neck, 258 cases, 3755

- atherosclerosis, carotid arteriography, doppler ultrasound flow meter, ultrasonics, real time ultrasonic imaging system, 3676

arteriole, blood pressure, capillary flow, centrifuge, gravitation, noradrenalin, 2 g centrifugation, second generation rats, carotid artery, mesentery arteriole, 716

arteriole resistance, kidney concentrating capacity, kidney medulla, model, nephron, rabbit, central core model, 916

arteriotomy, arteriography, brachial angiography, brachial artery, brain atherosclerosis, carotid artery, heart catheterization, neck, 258 cases, 3755

arteriovenous fistula, artery clamp, brain artery, stereotaxic surgery, clipping device, 1554

- blood flow, heart output, hemodialysis, dye dilution method, 15 patients, cimino brescia fistula, 3695
- brain angiography, brain hematoma, brain hemorrhage, computer assisted tomography, 78 cases, 3845

arteriovenous malformation, brain angiography, brain arteriovenous fistula, computer assisted tomography, 22 cases, 361

- cerebellum tentorium, computer assisted tomography, subarachnoid hemorrhage, vein sinus, vein thrombosis, normal ct appearance, nonneoplastic pathology, 1596
- computer assisted tomography, spinal cord, 4 cases, 834

arteriovenous oxygen difference, hemoglobin, oxygen blood level, spectrophotometry, flowing whole blood esophagus, 1002

arteriovenous shunt, biocompatibility, blood clotting, oxygenator, polysiloxane, silastic, thrombocyte count, lamb, 1869

- blood flow, heart muscle blood flow, heart output, indocyanine green, microsphere ce 141, microsphere sr 85, turkey, dog, 1474

arteritis, atherosclerosis, computer, data base, leg, 839

artery, anisotropy, aorta strip, mathematic model, viscoelasticity, dog, 1675

- artery elasticity, blood pressure, doppler ultrasound flow meter, echography, elasticity, mathematic model, 435
- artery flow, doppler ultrasound flow meter, femoral artery, information processing, model, transfer function model, 3543
- artery pulse, monitoring, photoelectric plethysmography, reflection photoplethysmography, 1446
- artery wall, blood vessel resistance, smooth muscle contraction, smooth muscle fiber, smooth muscle cell mechanics, 3143
- aspirator, bubble, vein, bubble removing, 1048
- atheroma, computer, macroaggregated albumin technetium 99m, technetium 99m, ulcer, videorecording, dog, 1614
- blood pressure, mathematic model, length force relation, volume pressure relation, 2794
- blood pressure, photometry, device for contact free recording, 147
- blood pressure, heart, model, dog, least energy, 2832
- blood vessel, mathematic model, arterial branching, 69
- blood vessel diameter, catheter flowmeter, electromagnetic flowmeter, 2599
- blood vessel muscle, brain artery, mathematic model, medial brain artery, smooth muscle, orientation, 1080
- blood vessel spasm, vein, vein diameter, angiometer, diameter, a electromagnet, 1840

- cannula, no kinking, 2939
- collagen, corrugated fibril mechanics, 637
- elasticity, mathematic model, model, hydraulic model, elastic non uniformity, 46
- elasticity, 3540
- micrometer, ultrasonics, artery diameter, transit time system, 2166
- artery catheterization**, catheter, lung artery, flush system, infusion system, drip chamber, 1066
- artery circumference**, artery resistance, blood pressure, heart output, mathematic model, measurement method, 3166
- artery clamp**, arteriovenous fistula, brain artery, stereotaxic surgery, clipping device, 1554
- artery counter pulsation**, aorta balloon, assisted circulation, computer, electrocardiography, trigger, optimum performance determination, 3098
 - assisted circulation, diastolic pulsator, device development, 3301
 - extracorporeal circulation, 3300
- artery elasticity**, artery, blood pressure, doppler ultrasound flow meter, echography, elasticity, mathematic model, 435
- artery flow**, analog model, mathematic model, 918
 - aorta, blood flow, blood vessel, carotid artery, doppler ultrasound flow meter, femoral artery, transcutaneous vs implanted cuff, 224
 - artery, doppler ultrasound flow meter, femoral artery, information processing, model, transfer function model, 3543
 - atherosclerosis, coronary artery, coronary artery blood flow, mathematic model, pulsatile flow, rheology, flow analysis, 2454
 - blood flow, blood pressure, mathematic model, pressure flow relationship, 2833
 - brachial artery, echography, noninvasive measurement, 603
 - hemodynamics, mathematic model, pulsatile flow, 2060
 - rubber tube, pressure radius relation, theory, tube flow, experiment, 1303
 - tube flow, pressure radius relation, 1302
 - artery bifurcation, reynold number, flow rate, area ratio, tube flow, 1301
- artery graft**, biocompatibility, blood, cell kinetics, prosthesis, thrombocyte, thrombosis, 3
- artery murmur**, artery occlusion, blood flow, cardiovascular murmur, mathematic model, phonocardiography, 1308
 - blood flow, model, phonocardiography, stenosis, 1709
- artery occlusion**, angiography, artificial embolism, balloon catheter, micro balloon catheter, 220
 - artery murmur, blood flow, cardiovascular murmur, mathematic model, phonocardiography, 1308
 - doppler ultrasound flow meter, hemodynamics, pulsatile flow, hydrodynamic bench, 3167
- artery pulse**, abdominal aorta coarctation, aorta stenosis, blood flow, blood pressure, dog, reflection of pressure and flow waves, 471
 - artery, monitoring, photoelectric plethysmography, reflection photoplethysmography, 1446
 - blood flow, computer model, heart output, heart stroke volume, 2065
 - computer, electrocardiography, heart left ventricle ejection time, heart sound, heart systolic time interval, surgery, pdp 11, real time, 851
- artery pulse rate**, blood pressure, dihydralazine, rat, apparatus, 2185
- artery resistance**, artery circumference, blood pressure, heart output, mathematic model, measurement method, 3166
- artery stenosis**, SEE artery occlusion
- artery wall**, artery, blood vessel resistance, smooth muscle contraction, smooth muscle fiber, smooth muscle cell mechanics, 3143
 - doppler ultrasound flow meter, ultrasonics, motion parameter, 2063
 - mathematic model, linear model, 2453
- artery wall compliance**, aorta, plethysmography, thoracic aorta, measurement, modeling, dog, 2598
 - aorta stenosis, hemodynamics, mitral valve regurgitation, model, hydraulic model, factors affecting transvalvar pressure, gorlin formula, 917
- arthritis**, age, arthrosis, rheology, sex, synovial fluid, human, 3519
 - biomechanics, osteosynthesis, patella fracture, 116 cases, 1262
- arthrodesis**, congenital hip dislocation, fracture external fixation, limb lengthening, pseudarthrosis, 48 patients, ilizarov apparatus, 3743
- arthroplasty**, joint total replacement, knee, subluxation, 1 yr follow up, 47 out of 53 cases, wide track polycentric knee prosthesis, 2645
- arthrosis**, age, arthritis, rheology, sex, synovial fluid, human, 3519
 - knee, varus knee, movement, varus stress, 3517
 - knee, muscle force, maximum stress evolution, 1269
- articular cartilage**, cartilage, femur, shear stress, viscoelasticity, rabbit, 38
 - properties measurement, scanning electron microscopy, 282
- articulator**, jaw surgery, prototype articulator, 3036

- artifact**, alpha rhythm, automation, delta rhythm, drowsiness, electroencephalography, theta rhythm, 31
 - subjects, artifact rejection, 1947
 - electrocardiography, electroencephalography, model, skin abrasion, skin dystrophy, skin injury, skin potential, sweating, transcutaneous stimulation, wound healing, 3234
- artifact reduction**, electrocardiography, electroencephalography, movement, skin abrasion, skin electrode, 1389
 - electrostimulator, iontophoresis, electrooptic coupler, 1070
 - evoked response audiometry, on line artefact rejection, active analog delay line, method, 2882
 - microiontophoresis, nerve cell potential, raphe nucleus, stimulation artifact, technique, 1806
- artificial embolism**, angiography, artery occlusion, balloon catheter, micro balloon catheter, 220
 - balloon, brain vascularization, carotid arteriography, technical note, 3327
 - carotidocavernous fistula, balloon occlusion, catheter, embolization, 1453
- artificial heart**, artificial muscle, nitinol, contractile artificial muscle, 1852
 - assisted circulation, heart left ventricle, starling law, automatic driving system, 2189
 - cause of death, hemodynamics, long term effect, calf, 1853
 - heart left ventricle, baylor pump, implantation, calves, 3296
- artificial heart pacemaker**, angiocardiology, data base, decision, minicomputer, 3095
 - artificial heart pacemaker failure, model, model medtronic 5880 a, inhibited by touching metal coverplate, 2937
 - battery, lithium, selection, different batteries, power source, 1466
 - battery, cremation, explosion, nuclear energy, mercury zinc batteries, lithium batteries, nuclear powered pacemakers, danger of explosion, britain, 2930
 - computer, long term control, pacemaker impulse, 1451
 - computer, vectorcardiology, pacemaker assessment, 1858
 - current density, electrode impedance, electrode surface geometry, current consumption, 2197
 - dentistry, electric accident, guidelines, 2927
 - diaphragm, electromyography, bipolar demand pacemaker, inhibition by diaphragmatic myopotentials, 2195
 - electrocardiology, telemetry, 965
 - electrocardiology, frequency modulation, monitoring, telemetry, telephone telemetry, 2678
 - electrode, endocardial electrode, low threshold endocardial electrode, 642
 - electrode, heart stimulation, stimulation threshold, comparative study, thresholds in leads of different size, 640
 - electrode, heart arrhythmia, heart atrioventricular block, 22 cases, epicardial screw in electrode, 631
 - electrode, elema emt 588 k, 47 patients, 2603
 - electrode, skin electrode, stimulation, thorax wall, external pacemaker, stimulation through subcutaneous pin electrodes, 2192
 - electrode, electrode model, tip stitched in myocardium, 3298
 - electrode, embolism, lung embolism, catheter embolism, migrating of retained pacemaker, 1479
 - electrode, heart stimulation, electrode surface area, 1054
 - electrode, mediastinum, sinus node, transmediastinal atrial sensing electrode placement, atrial programmed pacemaker, 31 cases, 1053
 - electrode, electrostimulation, endocardial pacing, heart, rate of electrode displacement, 1050
 - electrode, sutureless pacemaker lead, 1043
 - electromagnetic field, fluoroscopy, heart arrhythmia, interference, external demand pacemaker, 1041
 - electromagnetic radiation, heart arrhythmia, tachycardia, radiofrequency pacemakers, 3690
 - longevity, programmable pacemaker, 37 cases, 2932
 - magnet, thorax wall, 15 different implanted demand pacemakers, malfunction evaluation, magnet waving, electrical chest wall stimulation, 1452
 - microwave radiation, radar, 16 pacemakers, susceptibility, 218
 - power supply, 2204
 - pregnancy, 2592
 - measuring and therapy unit, 1854
 - pacemaker interference, auto interference, 222
 - philips tp 300, 2212
 - false sensing, sensing, 2184
 - output characteristic, circuit design, 1849
- artificial heart pacemaker failure**, artificial heart pacemaker, model, model medtronic 5880 a, inhibited by touching metal coverplate, 2937
 - inhibition, unipolar on demand pacemakers, 2605
- artificial intelligence**, algorithm, information science, fuzzy algorithm, 2524
- artificial kidney**, carbon 14, hemodialysis, cold carbon apparatus, 2223
 - cellophane, cellulose membrane, cuprophane, hemodialysis, hemodialysis membrane, ion exchange, 1875
 - dialysis membrane, erythrocyte, leukocyte, thrombocyte, blood component deposited, electron microscopy, 621
 - dialysis membrane, hemodialysis, progress in 20 years, 3720

- hemodialysis, dialysate recycle, 3320
- hemodialysis, adsorption system, design analog, 3319
- hemodialysis, hemoglobin, leak detector, 70
- hemodialysis, wearable kidney, instrumentation, 663
- hemodialysis, lundia mini minor, disposable dialyzer, child, 662
- hemodialysis, compact travel dialysis system, 1877
- hemodialysis, mathematic model, tubular haemodialyses, ultrafiltration, dialysate concentration, 2226
- hemodialysis, parallel plate dialysis, clinical performance, 2225
- hemodialysis, membrane support, parallel plate dialyses, 2224
- artificial muscle**, artificial heart, nitinol, contractile artificial muscle, 1852
- artificial organ**, adsorbent agent, compartment model, perfusion, fixed bed adsorber, 2059
- artificial skin**, back, disabled, hand prosthesis, skin, touch, 1908
- artificial tear**, cornea epithelium, oculus, tear, tear film, 2991
- artificial ventilation**, air flowmeter, monitoring, turbulent flow, 655
 - alarm monitoring, ventilator, benet, 3312
 - alarm monitoring, monitoring, respiration, device, 2606
 - alarm monitoring, positive end expiratory pressure, 746
 - anesthesia, digital system, ventilator, digital control, 1547
 - anesthesia, ventilator, standard adult equipment, rat, 653
 - anesthesia, brain depth recording, positive pressure ventilation, small animals, rat, 1484
 - anesthetic equipment, mapleson d system, 323
 - endotracheal intubation, esophagus, resuscitation, esophagus obturator, 2935
 - intensive care, mass spectrometry, 1060
 - newborn, positive end expiratory pressure, resuscitator, manual ventilation, peep device, continuous positive pressure, new device, 3709
 - ventilator, spiromat 650 reliability, 321
 - precom, alarm device, 647
 - ventilator adaptation, anesthesia circle system, 1544
 - intermittent mandatory ventilation, equipment, 3308
 - intermittent mandatory ventilation, ventilator weaning, synchronizative device, mandatory ventilation, 2609
- a scan**, b scan, echoculography, m scan, ultrasonics, new device, 2167
 - echography, eye, digital display, instrumentation, method, 1091
 - echoculography, gray scale echography, new device, 2910
- ascending aorta**, aorta surgery, aorta valve prosthesis, blood flow, extracorporeal circulation, mitral valve prosthesis, flowmetry, 2207
- ascorbic acid**, brain, cerebrospinal fluid, computer, extracellular space, mannitol, pharmacokinetics, model, rabbit, 859
- asepsis**, aerosol, bacterial pollution, bronchial asthma, fungus, infection, risk, 27 apparatuses, 18 subjects, mobile use, 1478
 - operating room, divided responsibility, 200
- aspartate aminotransferase blood level**, ammonium, brain edema, computer, electroencephalography, encephalopathy, exchange blood transfusion, fatty liver, furosemide, mannitol, reye syndrome, 7 children, 779
- aspiration**, anesthesia induction, anesthetic equipment, prevention, 3029
 - extracorporeal circulation, heart surgery, automatic control device, 3704
- aspiration biopsy**, computer assisted tomography, guiding of percutaneous biopsy, 830
- aspirator**, artery, bubble, vein, bubble removing, 1048
- assisted circulation**, aorta balloon, artery counter pulsation, computer, electrocardiography, trigger, optimum performance determination, 3098
 - aorta balloon, aorta pressure, blood vessel resistance, heart output, hydraulic power, dog, 1859
 - aorta balloon, aorta valve prosthesis, cardiovascular system, korotkow sound, simulator, design, performance, 2177
 - artery counter pulsation, diastolic pulsator, device development, 3301
 - artificial heart, heart left ventricle, starling law, automatic driving system, 2189
 - blood pump, magnetic field, blood pumping, 641
 - coronary care unit, electrocardiography, fluoroscopy, hemodynamics, monitoring, 3353 patients, 30 bed coronary care unit, 217
 - dura mater, heart left ventricle, valve, biohybrid intrathoracic device, 2188
 - forward heart failure, heart output, oxygen, external counter pulsator, 636
 - heart output, design, 219
 - hemodynamics, intracorporeal left ventricular assist device, 8 patients, 2205
- astigmatism**, aniseikonia, binocular vision, refraction, retina correspondence, retina image, problem of distortion, 2988
 - cataract extraction, cornea curvature, cornea transplantation, keratometer, microsurgery, troutman type,

- astrocytoma**, brain tumor, central nervous system metastasis, computer assisted tomography, craniopharyngioma, hypophysis adenoma, meningioma, 1658 cases, 817
- computer assisted tomography, corpus callosum tumor, evoked visual response, occipital cortex, optic radiation, 51 yr old man, necropsy, histopathology, 3724
- ataxia**, accelerometer, encephalopathy, tremor, triaxial accelerometer, 3334
- atelectasis**, open heart surgery, postoperative care, spirometry, incentive spirometer, bartlett edwards spirometer, prevention, 1868
- atherogenesis**, pulsatile flow, bifurcation, particle path and stasis, 2056
- atheroma**, artery, computer, macroaggregated albumin technetium 99m, technetium 99m, ulcer, videorecording, dog, 1614
- atherosclerosis**, arteriography, carotid arteriography, doppler ultrasound flow meter, ultrasonics, real time ultrasonic imaging system, 3676
- arteritis, computer, data base, leg, 839
 - artery flow, coronary artery, coronary artery blood flow, mathematic model, pulsatile flow, rheology, flow analysis, 2454
 - basilar artery ectasia, brain angiography, computer assisted tomography, 4 cases, 363
 - blood flow, thrombus, tube, bifurcation, particle behavior, 2459
 - blood flow, mathematic model, 2456
 - capillary flow, diabetes mellitus, hypertension, microscopy, skin capillary, television, vital television capillary microscopy, 3285
 - cholesterol, computer, densitometry, femoral angiography, cadaver angiograms, 1599
 - diffusion, diffusion equation, convective diffusion, bifurcation, 1300
 - leg, plethysmography, high gain capacitive plethysmograph, 1056
- athlete**, model, running, work, negative work, running speed, 6 athletes, 3516
- motivation, personality, psychology, sport, rating scale, coaching, 3474
- atlantoaxial dislocation**, computer assisted tomography, craniovertebral malformation, 2 cases, 1179
- atlas fracture**, computer assisted tomography, case report, 828
- atmosphere**, aerosol, air pollution, laser, lidar, 403
- air pollution, laser, vision, 1252
 - air pollution, environment, microwave radiation, sulfur dioxide, 1873
 - environment, scintillation, mechanism, turbulence, 16
 - environment, scintillation, 171
 - lung, pneumography, pressure transducer, respiration, 1912
- atmospheric radioactivity**, air sampling, filter, radon daughter, filter efficiency, 1337
- atomic number**, brain cyst, colloid cyst, computer assisted tomography, electron density, method, 12 cases, 2333
- nuclear radiation, photon absorption, radiation absorption, radiation scattering, radiotherapy, roentgen dose distribution, 727
- attention**, computer model, task performance, 1633
- attenuated virus**, central nervous system, live vaccine, lumbar spine, mathematic model, neurovirulence, poliomyelitis virus, thalamus, virus, virus virulence, neurovirulence assay, monkey, 3492
- attenuation**, gamma radiation, roentgen radiation, extrapolation, biologic material, 2665
- attenuator**, ad converter, amplifier, 2486
- echography, ultrasonics, automatic gain control, versatile attenuator, 1433
 - induction, voltage divider, low frequency divider, 954
- attitude**, aviation, cosmic radiation, neutron radiation, mid altitude flight, 3675
- computer, history, patients attitudes, 2311
- audioamplifier**, computer, electroencephalography, 2708
- electroconvulsive therapy, electromyography, muscle relaxation, 1500
- audiology**, hearing aid, earmold venting, filter effect, 3335
- speech training, portable equipment, children, 1507
- audiometry**, auditory masking, cochleography, evoked acoustic nerve response, meniere disease, sudden deafness, tuning curve, 2443
- auditory threshold, external ear, hearing, free field audiometry, lateral vertical plane, 683
 - auditory threshold, computer, 100 subject, computer vs manual audiometry, 3105
 - auditory threshold, high frequency audiometry, free field transducer system, 1834
 - bekesy audiometry, hearing, bekesy audiometer, 2259
 - bone conduction, bone conductor, hearing aid, frequency response, 1099
 - bone conduction, vibrator, calibration force level, 2 new vibrators, 3730
 - digital computer, 2260
 - head phone, 261
 - head phone, telephone, calibration, frequency response, 1431
 - hearing, coyote, 1518

- speech audiometry, calculation of hearing loss, 696
- auditory discrimination**, hearing, loudness, loudness discrimination, speech, vowel consonant, 703
- auditory fatigue**, auditory masking, auditory threshold, hearing, pure tone, 1088
- auditory masking**, audiometry, cochleography, evoked acoustic nerve response, meniere disease, sudden deafness, tuning curve, 2443
 - auditory fatigue, auditory threshold, hearing, pure tone, 1088
 - auditory threshold, hearing, 1681
 - basilar membrane, hearing, model, 457
 - binaural hearing, noise, phasic effect, 1686
 - binaural hearing, hearing, masking level, 702
 - critical band width, hearing, rippled noise masker, 1680
 - echo, hearing, masking level differences, 701
 - hearing, pattern recognition, sound burst, 264
 - hearing, information science, 258
 - hearing, pattern recognition, signal noise ratio, pure tone, 2820
 - hearing, backward masking, forward masking, 60
 - hearing, signal noise ratio, tone, 454
 - hearing, intelligibility, noise, pure tone stimulus, 1505
 - hearing, temporal masking, 2257
 - intelligibility, signal noise ratio, interrupted speech, 62
- auditory ossicle**, ear drum, electromagnet, mobility, objective mobility test, 3353
- auditory recruitment**, hearing aid, occupational deafness, speech intelligibility, protective hearing aid, 1102
- auditory rehabilitation**, ear drum, magnet, electromagnetic induction, 687
 - hearing aid, speech, australia, 1520
 - hearing aid, speech, processing of signals, 2977
- auditory stimulation**, auditory system, cochlea microphonic potential, electrode, sound, electrophonic effect, 689
- auditory stress**, ear trauma, environment, hearing, microphone, sound level measurement, conga microphone, 1019
- auditory system**, auditory stimulation, cochlea microphonic potential, electrode, sound, electrophonic effect, 689
 - computer model, evoked cortical response, signal noise ratio, human, 3483
 - electrode, evoked response audiometry, suction pressure electrodes, 695
 - hearing, psychophysics, vision, 250
 - memory, melody, tonal sequences, model, 1281
 - noise, psychoacoustics, detection of temporal gaps, decay of sensation, 1282
- auditory threshold**, acoustic reflex, growth function, 3347
 - age, hearing, hearing impairment, noise pollution, population research, 684
 - audiometry, external ear, hearing, free field audiometry, lateral vertical plane, 683
 - audiometry, computer, 100 subject, computer vs manual audiometry, 3105
 - audiometry, high frequency audiometry, free field transducer system, 1834
 - auditory fatigue, auditory masking, hearing, pure tone, 1088
 - auditory masking, hearing, 1681
 - hearing, reaction time, cat, titration procedure, 1092
- auditory training**, deafness, hearing aid, 2980
- auscultation**, education, stethoscope, group teaching, wireless stethoscope type headphone, 3702
 - heart sound, phonocardiography, tape recorder, 2198
 - micturition, sound, registration of sound micturition, 1876
- autoanalyzer**, computer, 3410
- autocorrelation**, alamethicin, lipid membrane, membrane permeability, membrane potential, power, multi pore system, autocorrelation analysis, power spectral density, 3549
- automation**, acid phosphatase, serum, 1171
 - ad converter, information processing, laboratory, microprocessor, multiplexer, modules marketing, 2519
 - aircraft, aviation, ergonomics, u.k., 3039
 - alpha rhythm, artifact, delta rhythm, drowsiness, electroencephalography, theta rhythm, 31 subjects, artifact rejection, 1947
 - antigen antibody reaction, immunoassay, turbidimetry, 756
 - aphasia, evoked cortical response, localization method, 3104
 - blood, leukocyte, corning larc leukocyte analyzer, 1561
 - blood carbon dioxide tension, blood gas, blood oxygen tension, automatic measurement, 562
 - blood group ABO system, blood group rhesus system, groupamatic, electronic data processing, 3687
 - blood transfusion, donor recipient identification system, 3601
 - cell identification, monocyte, spectral characteristics, automation, 333
 - cholinesterase, enzyme inhibition, information processing, stop flow technique, inhibition constant, 1151

- chromosome analysis, computer analysis, histogram, mitosis, automated classification, 2300
- circadian rhythm, hematocrit, hemoglobin, leukocyte count, thrombocyte count, differential count, hemalog d, 3685
- coding, medical record, automatic coding, natural language text processing, 1226
- computer, electroencephalography, frequency analysis, information processing, 776
- computer, electroencephalography, evoked response audiometry, 855
- computer, computer assisted diagnosis, electroencephalography, sleep electroencephalography, sleep waking cycle, review, analysis methods, 1569
- computer, heart infarction, heart left ventricle, heart ventricle arrhythmia, automated data processing, 1232
- computer, electroencephalography, information processing, 773
- disease classification, index, medical record, pathology, snop vs icd, 2744
- echocardiography, heart left ventricle, performance, ultrasonics, time to voltage analogue, converter, dog, 1455
- electroencephalography, information processing, sleep, eeg data processing chain, 778
- electroencephalography, spectrometry, method, 1387
- electroencephalography, epileptic focus, spike, autoregressive filter model, 4 patients, spike and wave, 1946
- electromyography, evoked muscle response, facial nerve paralysis, nerve stimulation, automatic electronic device, maximal stimulation test, 2759
- medical instrumentation, sewage treatment, water treatment, netherlands, 3208
- automobile industry**, accident, car driving, cost benefit analysis, risk factor, safety, usa, 1529
- automotive exhaust**, air pollution, anesthetic gas, operating room, workroom air, scavenging system, 1932
 - anesthesiology, hospital, operating room, scavenging system, mechanical aspects, 3393
 - anesthetic equipment, child anesthesia, scavenger, waste gases see exhaust gases, 1136
 - child anesthesia, scavenging system, 1135
 - nonrebreathing system, scavenging system, 319
 - operating room, scavenging system, 745
- autopsy**, cancerogenesis, cancer research, computer, data base, mouse strain, organ, pathology, national center for toxicological research, usa, automated pathology information system, 1158
- autoradiography**, beta emitter, scanning electron microscopy, location of beta emitter, 1017
 - image intensifier, radiography, thiourea, image improvement, underexposed radiography, 3391
 - image processing, photography, 535
 - lung, uranium dioxide u 235, neutron induced autoradiography, rat, 3255
 - nuclear radiation, photographic material, history, 3225
 - coating of multiple slides, horizontal drying of slides, in the dark, 2097
- avcothane**, biocompatibility, elastomer, artificial surface, surface structure, in vitro, 1244
- averaging**, ad converter, error, 2515
 - alpha rhythm, evoked cortical response, evoked visual response, alpha removal, 1998
 - blood flowmetry, electromagnetic flowmeter, dynamic calibration, 2943
 - cardiovascular system, data analysis, 3295
 - digital computer, digital filtering, electroencephalography, evoked response, evoked visual response, model, 3727
 - digital computer, electrocardiography, monitoring, vectorcardiography, 344
 - digital filtering, electroencephalography, application, 2516
 - electrocardiography, electroencephalography, fourier transform, phase locking, 1945
 - electroencephalography, parameter extraction, signal processing, 1753
 - evoked response, mathematic model, wiener filter, wiener filter vs averaging, 2229
 - iron 57, nuclear magnetic resonance, pulse generator, pulse echo, element analysis, 2858
 - radiation injury, signal detection, optimal use, 3836
 - sampling, trigger, time jitter, 1789
 - speech, 1687
 - transient recorder, multichannel, 985
- aversion therapy**, behavior disorder, generator, odor, smelling, olfactory procedure, new apparatus, 244
- aviation**, aerospace medicine, ophthalmology, vision, visual field, space studying device, flight simulation, 3368
 - aircraft, automation, ergonomics, u.k., 3039
 - attitude, cosmic radiation, neutron radiation, mid altitude flight, 3675
 - bone density, helicopter pilot, skeleton, vibration, skeletal system, response, 3010
 - electrocardiography, electroencephalography, electromyography, respiration, skin conductance, inexpensive recording method, 296
 - graphology, image processing, pattern recognition, photography, 1695
- axoplasm flow**, computer, mitochondria, spinal cord, tissue culture, mouse, 2372
 - horseradish peroxidase, hypothalamus, simple injection device, nanolitre volume, 2961

- back**, artificial skin, disabled, hand prosthesis, skin, touch, 1908
- backache**, brain angiography, patient back pain reduction, 3770
- background radiation**, decision, dosimetry, model, radioactivity, statistics, statistical interpretation of counting data, 306
- back muscle**, acceleration, electromyography, impact, dog, 715
- bacterial pollution**, aerosol, asepsis, bronchial asthma, fungus, infection, risk, 27 apparatuses, 18 subjects, mobile use, 1478
- bacteriology**, antibiotic agent, digital computer, autobac, ms2, abac, 3799
- ballistocardiography**, cardiovascular system, model, 216
- balloon**, artificial embolism, brain vascularization, carotid arteriography, technical note, 3327
- balloon catheter**, angiography, artery occlusion, artificial embolism, micro balloon catheter, 220
- balneology**, duodenum ulcer, exercise, heart rate, kinesiotherapy, telemetry, czechoslovakia, 522
- balneotherapy**, electrocardiography, monitoring, telemetry, 969
- band pass filter**, active filter, 515
 - digital filtering, design, 137
 - information processing, mathematic model, nerve potential, vision, visual stimulation, non linear spatial filter, 912
- barany test**, mathematic model, vestibular nystagmus, 1662
- barium**, computer model, nerve cell membrane potential, tetrodotoxin, aplysia, 2467
- basal metabolic rate**, oxygen consumption, accuracy of measurement method, 2915
- base**, acid, bilayer membrane, economics, engineering, 3491
- basilar artery ectasia**, atherosclerosis, brain angiography, computer assisted tomography, 4 cases, 363
- basilar membrane**, auditory masking, hearing, model, 457
 - cochlea, hair cell, model, tuning model comparison, 2822
 - cochlea, cochlea fluid, mathematic model, 2 dimensional model, 59
 - cochlea, mathematic model, linear and nonlinear model, 1666
 - cochlea model, transients, 36
 - hearing, model, frequency discrimination, 1287
 - mathematic model, non linear model, 2413
- battery**, artificial heart pacemaker, lithium, selection, different batteries, power source, 1466
 - artificial heart pacemaker, cremation, explosion, nuclear energy, mercury zinc batteries, lithium batteries, nuclear powered pacemakers, danger of explosion, britain, 2930
 - hearing aid, development, 685
- bcg vaccination**, multipuncture, new japanese equipment, 2913
- beam profile**, cancer, cobalt therapy, dosimetry, phantom, 3433
 - cancer, pion radiation, radiotherapy, roentgen dose distribution, 3431
 - cobalt 60, contour, gamma radiation, radiotherapy, central axis, 2273
 - cobalt therapy, dosimetry, skin, skin test, 3373
 - dosimetry, roentgen apparatus, roentgen dose distribution, star test pattern, 315
 - dosimetry, pion radiation, radiotherapy, 3372
- bed**, body posture, electrocardiography, monitoring, false alarm by body position in bed, 227
 - nursing, electro pneumatic high low bed, 3003
 - nursing, patient care, sand bed, 605
- behavior**, aggression, mathematic model, predator prey communities, 14
 - brain depth recording, brain depth stimulation, stereotaxic implantation, stimulator, iguana, 243
 - centrifuge, gravity, sitting, non linear properties, upright sitting human body, driving point impedance, 2652
 - communication, cosmonaut, medical assessment, space flight, space time dialogue, 295
 - computer, electrocardiography, hippocampus, behavior quantification, 2758
 - computer, interview, medical record, problem oriented record, 2368
 - computer, health care delivery, information processing, ambulatory patients, 3406
 - computer, interview, assessment, 3050
 - computer model, model, sexual behavior, newt, 395
 - decision, mathematic model, motivation, nerve cell network, statistics, stimulus, behavioral mode selection, 399
 - dispenser, fluid, multiple liquid dispenser, catfish, 2970
 - electromyography, head movement, neck muscle, photography, vision, 2638
 - hearing, reaction time, restraining device, tone, cat, 2245
 - magnetic field, low frequency magnetic fields, monkey, 3488
 - mathematic model, n person game, 2773
 - memory, model, picturephone, 2975
 - psychiatry, personal relation index, 2237
 - self medication, method, rat, pneumatic syringe, 2968
 - stimulation, vibration, pocket sized cueing device, 245
 - tape recorder, simple device, 2236

behavior disorder, aversion therapy, generator, odor, smelling, olfactory procedure, new apparatus, 244

bekeasy audiometry, age, bone conduction, stapes, automatic audiometry, grason stadler bekesy audiometer, 3480

- audiometry, hearing, bekesy audiometer, 2259

below knee amputation, above knee amputation, immediate prosthesis, weight bearing, load cell, 1118

benzimidazole derivative, cell membrane, mathematic model, mitochondria, oxidative phosphorylation, in vitro, model study, 2764

beryllium, deuteron radiation, dosimetry, fast neutron radiation, fast proton radiation, neutron generator, characterization of neutron beam, 2662

- dosimetry, fast neutron radiation, fast proton radiation, lithium, 2572

beta radiation, brems radiation, photochemistry, evaluation, 589

- dosimetry, phantom, gamma radiation, radiotherapy, roentgen radiation, tissue equivalent, 2928
- evolution, radioactivity, optical purity, 2850
- monochromator, 593
- gamma radiation, thermoluminescence dosimeter, lif response, effect of annealing, 2156
- thermoluminescence dosimeter, graphite mixed caso₄ dy teflon disk, 2158
- ultraviolet radiation, image sensor, ion radiation, microchannel plate, 1533

beta rhythm, alpha rhythm, computer, electroencephalography, mu rhythm, analysis, 500 eeg's, 1570

- alpha rhythm, computer, delta rhythm, electroencephalography, theta rhythm, 306 subjects, normal value, computer analysis, 2705

betatron, dosimetry, megavoltage radiotherapy, radiotherapy, tiddue maximum ratio, tumor maximum ratio, 2482

- dosimetry, linear accelerator, neutron radiation, radiation exposure, 2852
- megavoltage radiotherapy, whole body radiotherapy, arc therapy, 2666

bicarbonate, antimony, buffer, carbon dioxide, carbon dioxide tension, hydrogen ion, microelectrode, oxygen tension, antimony microelectrode, 165

biceps brachii muscle, alcoholism, amyotrophic lateral sclerosis, anterior tibial muscle, electromyography, motoneuron disease, muscular dystrophy, polyneuropathy, muaps, automatic analysis, 14 controls, 11 cases, 857

- electromyography, muscle force, 1905

bicycle ergometry, calculation, heart function test, oxygen consumption, step test, cylinder, 646

- electromyography, muscle contraction, muscle load, special ergometer, human muscle, 3749
- exercise, muscle performance, crank force, one or two leg cycling, 443

bilayer membrane, acid, base, economics, engineering, 3491

bile, bromsulphthalein, computer model, drug interaction, pharmacokinetics, warfarin, 3498

bile duct, biliary tract endoscopy, cholangiography, fujinon, 617

biliary tract, common bile duct, endoscopy, choledochofiberscope, 200 patients, diagnosis, 3275

biliary tract endoscopy, bile duct, cholangiography, fujinon, 617

binaural hearing, auditory masking, hearing, masking level, 702

- auditory masking, noise, phasic effect, 1686
- correlation function, hearing, 2984
- directional hearing, echolocation, mathematic model, 3155
- directional hearing, hearing, auditory time discrimination, 52
- directional hearing, hearing, auditory lateralization, complex waveform, 1089
- directional hearing, hearing, moving source, dichotic stimulation, 4 volunteers, 1284
- directional hearing, hearing, minimum auditory movement angle, 3345
- hearing, rotating tone, beats, 699
- hearing, loudness perception, interaural intensity difference, 452
- hearing, tone burst, onset, ongoing, offset, temperal difference, 61
- hearing, noise, pitch perception, review, 900
- hearing, intelligibility, speech, interfering speech, human, 55
- hearing, sound lateralization, dichotic stimulus, 3348
- interaural alternation, 253

binocular contrast, visual discrimination, analyzer, 3534

binocular ophthalmoscope, indirect ophthalmoscopy, new device, method, 2254

binocular vision, aniseikonia, astigmatism, refraction, retina correspondence, retina image, problem of distortion, 2988

- computer model, depth perception, scheme, 691
- optometry, new device for testing, 1898
- visual field, binocular fixation, testing device, 693

bioassay, computer, information processing, radioimmunoassay, desk top computer, 755

bioavailability, blood cell aggregation, drug clearance, drug metabolism, drug protein binding, enzyme, liver blood flow, mathematic model, pharmacokinetics, review, 3108

biochemistry, computer program, differentiation, digital computer, 3045

biocompatibility, acetal, cell culture, cytotoxicity, nylon, plastic, polyethylene, polystyrene, polyurethan, silastic,

- teflon, testing, 866
- acrylonitrile, blood, thrombocyte, structure, 383
- aluminum silicate, serum protein, teflon, thrombocyte adhesiveness, 2001
- arteriovenous shunt, blood clotting, oxygenator, polysiloxane, silastic, thrombocyte count, lamb, 1869
- artery graft, blood, cell kinetics, prosthesis, thrombocyte, thrombosis, 3
- avcothane, elastomer, artificial surface, surface structure, in vitro, 1244
- biodynamics**, airplane pilot, mathematic model, model, parachutist, ucin crash victim simulation code, wind loading effect, 3364
- bioelectronics**, bioenergy, direct current converter, power supply, solar cell, telemetry, 3214
- bioenergy**, bioelectronics, direct current converter, power supply, solar cell, telemetry, 3214
 - galvanic current, power supply, voltage frequency converter, rat, dog, rabbit, 928
- bioengineering**, cost effectiveness, hospital, medical instrumentation, 450 beds hospital, 1621
 - ergonomics, industry, occupational health, work environment, manual labor, uk, overview, 2653
- biofeedback**, alpha rhythm, electroencephalography, statistical properties, 6 volunteers, 83
 - anxiety, electromyography, epilepsy, insomnia, paralysis, spasticity, tension headache, clinical application, review, 1081
 - cheyne stokes breathing, chronic granulocytic leukemia, hematopoietic disease, mathematic model, nonlinear system, process control, respiration, 1299
 - circadian rhythm, heart, mathematic model, sweating, 2791
 - electromyography, rehabilitation, toy, myodisplay instrument, child, 279
 - medical instrumentation, pain, placebo, placebo effect, 1887
 - myoelectric control, occupational therapist, orthotics, prosthesis, 1113
- biological model**, biomechanics, cadaver, injury, thorax, 3137
 - computer model, muscle fiber membrane, muscle fiber membrane resistance, cable model, parameter determination, 1317
 - computer model, model, oxygen transport, 2451
- biology**, computer, ecology, mathematic model, model, algorithm, 1788
- biomechanics**, age, sex, skin, living skin, tension extension ratio, human, 1910
 - ankle, muscle strength, strength duration curve, tibialis anterior muscle, model, dog, 287
 - arthritis, osteosynthesis, patella fracture, 116 cases, 1262
 - biological model, cadaver, injury, thorax, 3137
 - bone, compact bone, hip bone, pelvis, bone stress evaluation, 3148
 - bone, cortical bone, orthopedic surgery, bone pin connection, 3136
 - bone infection, fracture, fracture external fixation, osteosynthesis, survey, 1109
 - bone strength, femur, stress, three dimensional analysis, human, 2028
 - cervical spine, trauma, 1275
 - distal radioulnar joint, radioulnar dislocation, biomechanics, 6 operative techniques, 2799
 - elbow, joint mobility, pronation, supination, 100 volunteers, 1658
 - endoprosthesis, femur, biomechanics of stress and strain, 3740
 - femur osteotomy, knee, tibia osteotomy, stress correction, 2798
 - forelimb, intraarticular pressure, joint, ligament, tendon, race horse, 2805
 - fourier transform, heart ventricle, functional model, 1664
 - fracture healing, tibia fracture, internal junction, 2030
 - hand, hand function, thumb, static forces, 42
 - hand, metacarpophalangeal joint, 2027
 - injury, biomechanical aspects, 2802
 - intervertebral disk, mathematic model, spine, workload, systems identification scheme, linear viscoelastic properties, 3140
 - joint, lubrication, elastohydrodynamic lubrication, 2807
 - knee, knee prosthesis, simulator, knee joint simulator, 3004
 - knee, knee prosthesis, human knee joint, 47
 - mathematic model, muscle, muscle contraction, 1667
 - orthosis, 285
 - shoe, portable force measuring device, 281
 - skin dystrophy, method, 2804
 - spine, 273
- biometry**, electrooculography, eye, ultrasonics, new device, technique, measurement, axial length, 2987
- biopharmaceutics**, drug release, gastrointestinal tract, mathematic model, pharmacokinetics, 1627
- biophysics**, epidermis, skin, thermodynamics, nondestructive measurement, 3151
 - quantum mechanics, review, 2019
 - wave velocity, excitable medium, 491
- biopolymer**, dielectric constant, 2889
 - thermoelectricity, seebeck coefficient, 2544
- biopsy**, computer assisted tomography, nerve block, interventional scanning, 160 cases, 2743

birefringent filter, tunable filter, 948

birth rate, mortality, population model, 1258

biting pressure, force transducer, piezoelectric transducer, volunteers, 507

bladder, bladder pacemaker, electrode, implant, micturition, paraplegia, quadriplegia, spinal cord injury, urethra, baboon, 1486

- blood vessel muscle, portal vein, smooth muscle, quick load change, rat, rabbit, 2815
- chloride, freeze drying, potassium, roentgen analysis, skin, sodium, soft tissue, frog, toad, 2860
- computer model, neurogenic bladder, model, 2458

bladder cancer, computer assisted tomography, survey, 3449

bladder carcinoma, cancer cytodiagnosis, cell dedifferentiation, computer, urogenital tract, unsupervised learning algorithms, 1156

- cancer cytodiagnosis, cell dedifferentiation, computer, urogenital tract, supervised learning algorithms, classification, 1155
- cancer staging, computer assisted tomography, experience, 786
- computer assisted tomography, pelvis, pelvis cancer, prostate, survey, 3450

bladder pacemaker, bladder electrode, implant, micturition, paraplegia, quadriplegia, spinal cord injury, urethra, baboon, 1486

- electrostimulation, urine incontinence, 2958
- urine incontinence, hydrolic device, 3718

bladder pressure, micturition, urethra pressure, experimental model, 2616

bladder sphincter, electrostimulation, stress incontinence, urethra pressure, urine incontinence, 40 patients, 664

- prosthesis, urethra obstruction, urine incontinence, implantable hydraulic system, 2222

bladder wall permeability, epithelium, skin permeability, xenon 133, in vitro, water boundary layer, frog, 2012

blindness, computer assisted tomography, epiphora, exophthalmos, headache, mucocele, ophthalmoplegia, paranasal sinus, ptosis, 4 cases, 2737

- deafness, display system, electrostimulator, touch, 2981
- disabled, prosthesis, volume measurement, filling cup, 2258
- laser cane, mobility, visual aid, electronic aids, sonic guide, children, pathsounder, 1508
- pattern recognition, touch, visual aid, 'tactile' vision, 697

blood, acrylonitrile, biocompatibility, thrombocyte, structure, 383

- artery graft, biocompatibility, cell kinetics, prosthesis, thrombocyte, thrombosis, 3
- automation, leukocyte, corning larc leukocyte analyzer, 1561
- bone, compartment model, fourier transform, tissue, markov model, 2778
- cerebrospinal fluid, computer assisted tomography, quantitative aspects, fresh and coagulated blood, 832
- echography, scattering, sound, ultrasonics, 1285
- echography, ultrasonics, sound scattering, 2280
- electrolyte balance, erythrocyte, magnetic field, plasma, potassium, sodium, rat, 1243
- emergency, lung blood flow, lung insufficiency, microfilter, filtration rationale, 3280
- erythrocyte, mathematic model, sound, erythrocyte shape and propagation, 2821
- hemodialysis, ultrafiltration, design analysis, model, 620
- model, pharmacokinetics, simulation of blood level curves, 411
- oxygenation, silastic, tube, complex geometry, helical coil, 629

blood autotransfusion, device, 3686

blood bank, decision, frozen blood, utilization, 1838

blood carbon dioxide, carbon dioxide, plasma, measurement, ericsen e 101, 2551

- determination, apparatus, 3239

blood carbon dioxide tension, automation, blood gas, blood oxygen tension, automatic measurement, 562

- blood oxygen tension, blood ph, blood sampling, blood storage, syringe, b109 sampler, 622

blood cell aggregation, bioavailability, drug clearance, drug metabolism, drug protein binding, enzyme, liver blood flow, mathematic model, pharmacokinetics, review, 3108

blood cell count, erythrocyte, laser, leukocyte, thrombocyte, laser beam optics, hemac 6301, 570

blood chemistry, anesthetic agent, blood pressure, computer, electroencephalography, monitoring, open heart surgery, temperature, patient monitoring system, 350

blood clotting, arteriovenous shunt, biocompatibility, oxygenator, polysiloxane, silastic, thrombocyte count, lamb, 1869

- electricity, fibrinolysis, dog, 1039
- electricity, fibrinogen, dog, 2921
- interferometry, ultrasonics, 2587
- surface, thrombocyte, blood surface interaction, hydrogel interfaces, 1037

blood clotting factor, blood clotting time, computer, reference curves, 2306

blood clotting time, blood clotting factor, computer, reference curves, 2306

blood disease, cell membrane, erythrocyte membrane, erythrocyte osmotic fragility, statistics, osmotic fragility curve, 2180

blood filter, blood transfusion, micropore filter, indication, 619

- blood transfusion, microaggregate, effectiveness, review, 213
- extracorporeal circulation, filter evaluation, 3281
- blood flow**, abdominal aorta coarctation, aorta stenosis, artery pulse, blood pressure, dog, reflection of pressure and flow waves, 471
 - angiography, magnetorheography, rheology, dog, 3753
 - aorta, artery flow, blood vessel, carotid artery, doppler ultrasound flow meter, femoral artery, transcutaneous vs implanted cuff, 224
 - aorta flow, flow probe, probe placement device, 3297
 - aorta surgery, aorta valve prosthesis, ascending aorta, extracorporeal circulation, mitral valve prosthesis, flowmetry, 2207
 - arteriovenous fistula, heart output, hemodialysis, dye dilution method, 15 patients, cimino brescia fistula, 3695
 - arteriovenous shunt, heart muscle blood flow, heart output, indocyanine green, microsphere ce 141, microsphere sr 85, turkey, dog, 1474
 - artery flow, blood pressure, mathematic model, pressure flow relationship, 2833
 - artery murmur, model, phonocardiography, stenosis, 1709
 - artery murmur, artery occlusion, cardiovascular murmur, mathematic model, phonocardiography, 1308
 - artery pulse, computer model, heart output, heart stroke volume, 2065
 - atherosclerosis, thrombus, tube, bifurcation, particle behavior, 2459
 - atherosclerosis, mathematic model, 2456
 - blood pressure, capillary flow, infrared radiation, rheology, 3288
 - blood pressure, controlled flow and pressure, 1310
 - body temperature, heart output, mathematic model, skin temperature, transient response, human, thermoregulation, 448
 - brain blood flow, hydraulic impedance, dog, 1305
 - breast cancer, cancer screening, doppler ultrasound flow meter, ultrasonics, 3015
 - capillary flow, doppler ultrasound flow meter, laser, laser doppler measurement, 3694
 - catheter, flowmeter, velocity, cross section and flow, 2199
 - circulation, heart left ventricle, hemodynamics, mathematic model, parameter extraction, 469
 - computer, radiocardiography, scintillation camera, 131 cases, 2349
 - digital computer, doppler ultrasound flow meter, information processing, ultrasonics, 2755
 - doppler ultrasound flow meter, applications, prospects, 1384
 - doppler ultrasound flow meter, echography, transit time, 740
 - doppler ultrasound flow meter, heart catheterization, deep arteries, 225
 - erythrocyte, oxygen consumption, tube, turbulent flow, 1702
 - indicator dilution curve, mathematic model, pulsatile flow, 476
 - indicator dilution curve, frequency function computation, 2942
 - indicator dilution curve, mathematic model, vascular bed, 1715
 - trachea, trachea mucosa, trachea tube, cuff pressure, dog, 1483
 - intravascular elutherm probe, 1450
- blood flowmetry**, averaging, electromagnetic flowmeter, dynamic calibration, 2943
 - blood vessel resistance, resistance meter, difference pressure flow meter, 3294
 - doppler ultrasound flow meter, flowmeter, 3708
 - electromagnetic flowmeter, zero offset, 2922
- blood gas**, acid base balance, computer, information processing, 3412
 - acid base balance, blood sampling, syringe, b109 syringe, 2920
 - automation, blood carbon dioxide tension, blood oxygen tension, automatic measurement, 562
 - blood volume, calculation, extracorporeal circulation, calculation model sr-52, 3706
- blood glucose**, glucagon, glucose tolerance test, insulin release, mathematic model, model studies, 3113
- blood group ABO system**, automation, blood group rhesus system, groupamatic, electronic data processing, 3687
- blood group rhesus system**, automation, blood group ABO system, groupamatic, electronic data processing, 3687
- blood group typing**, computer, information system, lyon, 3793
- blood oxygen**, SEE oxygen blood level
- blood oxygen tension**, automation, blood carbon dioxide tension, blood gas, automatic measurement, 562
 - blood carbon dioxide tension, blood ph, blood sampling, blood storage, syringe, b109 sampler, 622
 - countercurrent multiplier system, gas, mathematic model, oxygen electrode, swimming device, experimental model verification, eel, 914
- blood ph**, blood carbon dioxide tension, blood oxygen tension, blood sampling, blood storage, syringe, b109 sampler, 622
- blood pressure**, abdominal aorta coarctation, aorta stenosis, artery pulse, blood flow, dog, reflection of pressure and flow waves, 471
 - anesthesia, feedback system, halothane, 3 patients, 1134

- anesthetic agent, blood chemistry, computer, electroencephalography, monitoring, open heart surgery, temperature, patient monitoring system, 350
- antigravity suit, trousers, pressure support, 3293
- arm prosthesis, digital computer, electroencephalography, heart catheterization, microprocessor, monitoring, prosthesis, 2685
- arteriole, capillary flow, centrifuge, gravitation, noradrenalin, 2 g centrifugation, second generation rats, carotid artery, mesentery arteriole, 716
- artery, artery elasticity, doppler ultrasound flow meter, echography, elasticity, mathematic model, 435
- artery, mathematic model, length force relation, volume pressure relation, 2794
- artery, photometry, device for contact free recording, 147
- artery, heart, model, dog, least energy, 2832
- artery circumference, artery resistance, heart output, mathematic model, measurement method, 3166
- artery flow, blood flow, mathematic model, pressure flow relationship, 2833
- artery pulse rate, dihydralazine, rat, apparatus, 2185
- blood flow, capillary flow, infrared radiation, rheology, 3288
- blood flow, controlled flow and pressure, 1310
- blood vessel resistance, kidney failure, mathematic model, renovascular hypertension, sodium, water, 2420
- cardi tachometer, electrocardiography, heart rate, 2917
- carotid artery obstruction, echography, eye pulse, ultrasonics, no touch measurements, 1473
- catheter, pressure transducer, small animals, microtransducer, pressure step calibration, 2533
- central venous pressure, computer, electrocardiography, electroencephalography, monitoring, 781
- cooling, finger, raynaud phenomenon, skin temperature, pressure measurement, human, 2208
- cuff, automation, 2602
- echography, gas bubble, heart ventricle pressure, ultrasonics, noninvasive measurement, 1471
- electrocardiography, systolic blood pressure, automatic slope display, 652
- exercise, telemetry, 528
- exercise, heart rate, heart work, oxygen consumption, rest, automatic measurement, 2753
- exercise, monitoring, sphygmomanometry, semiautomatic monitoring, electronic sphygmomanometer, 2186
- heart atrium pressure, pressure control, 2945
- heart left ventricle, heart ventricle pressure, mathematic model, statistics, ape, self modelling, 1712
- heart rate, isoprenaline, dog, direct measurement, 2601
- measurement, unrestrained rat, 2209
- indirect blood pressure measurement cuff choice, 1445
- blood pressure meter**, micropipette, pipet, 1472
- blood pump**, assisted circulation, magnetic field, blood pumping, 641
 - extracorporeal circulation, heart lung machine, self regulating pump, 221
- blood rheology**, carbon dioxide, gas diffusion, hemoglobin, mathematic model, oxygen, ph, 1307
 - erythrocyte deformability, micropipette, electronic flow measurement, tube flow, 472
- blood sampling**, acid base balance, blood gas, syringe, b109 syringe, 2920
 - blood carbon dioxide tension, blood oxygen tension, blood ph, blood storage, syringe, b109 sampler, 622
 - catheter, double lumen catheter, 626
 - catheter, cold, intravenous infusion, temperature control, catheter content control, sheep, 2938
- blood stain**, clothing, forensic medicine, isoenzyme, lactate dehydrogenase, soil, weapon, species origin, 3276
- blood storage**, blood carbon dioxide tension, blood oxygen tension, blood ph, blood sampling, syringe, b109 sampler, 622
 - blood transfusion, microaggregates, 1038
- blood transfusion**, automation, donor recipient identification system, 3601
 - blood filter, micropore filter, indication, 619
 - blood filter, microaggregate, effectiveness, review, 213
 - blood storage, microaggregates, 1038
 - blood warming, comparative study, 3 apparatus, 3688
- blood vessel**, angiography, image processing, methods comparison, 737
 - angiography, computer model, phantom, 1862
 - aorta, artery flow, blood flow, carotid artery, doppler ultrasound flow meter, femoral artery, transcutaneous vs implanted cuff, 224
 - artery, mathematic model, arterial branching, 69
 - brain, brain depth injection, cannula, cerebrospinal fluid pressure, 677
 - mathematic model, shear stress, shear strength, blood vessel radii, 447
- blood vessel catheterization**, hemodynamics, model, 638
- blood vessel diameter**, artery, catheter flowmeter, electromagnetic flowmeter, 2599
- blood vessel injury**, angiography, brain, decision theory, 1222
- blood vessel muscle**, artery, brain artery, mathematic model, medial brain artery, smooth muscle, orientation, 1080
 - bladder, portal vein, smooth muscle, quick load change, rat, rabbit, 2815

- blood vessel resistance**, aorta balloon, aorta pressure, assisted circulation, heart output, hydraulic power, dog, 1859
 - artery, artery wall, smooth muscle contraction, smooth muscle fiber, smooth muscle cell mechanics, 3143
 - blood flowmetry, resistance meter, difference pressure flow meter, 3294
 - blood pressure, kidney failure, mathematic model, renovascular hypertension, sodium, water, 2420
 - computer model, indicator dilution curve, model study, dog, intravenous administration, 2455
 - muscle blood flow, papaverine, sympathectomy, vasodilatation, rate sensitivity regulation, cat, 645
- blood vessel spasm**, artery, vein, vein diameter, angiometer, diameter, a electromagnet, 1840
- blood viscosity**, capillary permeability, hematocrit, mathematic model, serum protein, 3541
 - catheter, manometry, serum colloid osmotic pressure, continuous measurement, 212
 - erythrocyte sedimentation rate, semi empirical approach, 623
 - flow, mathematic model, viscosity, radial viscosity, 1306
 - glass capillary, shear rate, different shear rates, 3170
- blood volume**, aldosterone, angiotensin, computer model, kidney function, vasopressin, 1311
 - blood gas, calculation, extracorporeal circulation, calculation model sr-52, 3706
 - great vessels transposition, indicator dilution curve, lung blood flow, model, new technique, 3703
- blood warming**, blood transfusion, comparative study, 3 apparatus, 3688
- blunt trauma**, acceleration, deceleration, traffic accident, trauma, velocity, tolerance to impact acceleration, 2803
- B lymphocyte**, acute lymphoblastic leukemia, computer, data base, T lymphocyte, clinfo, 2365
- body**, anesthesia, electrostatic charge, explosion hazard, capacitance measurement, human body, 1390
 - electrocardiography, mathematic model, thorax electric field, 1314
 - heat transfer, homeothermia, mathematic model, newborn, thermoregulation, body insulation, critical size, 897
 - movement, angular moment determination, 1657
- body burden**, bone, computer, neutron activation analysis, plutonium 239, 811
 - dosimetry, prostate scintiscanning, zinc, zinc 69m, permissible body burden, 940
 - radioactive contamination, radium 226, strontium 90, retention, excretion, 2 cases, 10 yr follow up, 94
 - radioisotope, maximum permissible concentration, medical internal radiation dose committee, 3566
 - whole body counter, whole body analysis, 3392
- body cast**, orthopedics, prosthesis, seat, wheelchair, body cast vacuum form method, 280
- body height**, body surface, body weight, measurement, guinea pig, 2881
- body plethysmography**, airway resistance, computer, total lung volume, manual vs automated method, 231
 - computer model, lung compliance, respiration, 439
 - temperature, 2611
- body position**, radiotherapy, whole body repositioning system, 3381
- body posture**, acceleration, impact, intervertebral disk, model, seat, musculoskeletal model, 3138
 - airplane pilot, hand, head, instrument panel, vibration, fighter bomber, lumped parameter biomechanical model, 3366
 - bed, electrocardiography, monitoring, false alarm by body position in bed, 227
 - cerebral palsy, chair, electromyography, ergonomics, sitting, method, 284
 - computer, eye movement, stabilography, visual stimulation, 275
 - electrocardiography, heart infarction, heart rate, st segment, thorax electric field, 35 precordial leads, method, 1049
- body surface**, body height, body weight, measurement, guinea pig, 2881
- body temperature**, anesthesia, anesthetic equipment, heated operating board, 3030
 - blood flow, heart output, mathematic model, skin temperature, transient response, human, thermoregulation, 448
 - breathing work, compartment model, lung ventilation perfusion ratio, panting, respiration control, thermoregulation, dog, 1699
 - calorimetry, heat clearance, microwave radiation, radiation hazard, mice, 2433
 - circadian rhythm, computer, confinement, heart rate, walking, sheep, 847
 - computer, core temperature, telemetry, small animals, 2112
 - diving, hyperbarism, telemetry, dog, 1000 fsw, 3582
 - dopamine, electric field, hyperthermia, hypothalamus, microwave radiation, noradrenalin, serotonin, rat, 2579
 - electromagnetic radiation, pressure measurement, telemetry, fish, 968
 - electromagnetic radiation, heart rate, hibernation, telemetry, squirrel, 967
 - monitoring, transcutaneous measurement, 3683
 - newborn, thermoregulation, temperature measurement, mouse, 2580
 - skinfold, noninvasive measurement method, 207
- body weight**, body height, body surface, measurement, guinea pig, 2881
 - casein, mathematic model, nutrient, rat, 13
 - computer, medical record, obesity, medical condition evaluation, 13110 examinations, 3848
 - computer model, hunger, satiety, review, computer simulation, control mechanism, 867

- boiling point**, solution, thermistor, thermometer, boiling point elevation, 2130
- bolometer**, amplifier, electromagnetic radiation, signal noise ratio, 2147
- bone**, alkaline phosphatase isoenzyme, intestine, radiation injury, whole body radiation, biologic dosimetry, rat, 1162
 - biomechanics, compact bone, hip bone, pelvis, bone stress evaluation, 3148
 - biomechanics, cortical bone, orthopedic surgery, bone pin connection, 3136
 - blood, compartment model, fourier transform, tissue, markov model, 2778
 - body burden, computer, neutron activation analysis, plutonium 239, 811
 - bone biopsy, bone strength, bone hole, cadaver experiment, 1264
 - bone piezoelectric potential, collagen, femur, collagen crosslink, binding sequence, rat, 2066
 - bone strength, fatigue, model, stress, bone bending fatigue strength, human, 3139
 - cartilage, ear, high frequency cinematography, grinding instruments, 326
 - ceramics, biodegradation, 384
 - crystal, electron spin resonance, radiation injury, random orientation, 187
 - dosimetry, megavoltage radiotherapy, radiation attenuation, roentgen dose distribution, 2096
 - fallout, strontium 90, yugoslavia, 1339
 - gadolinium 153, photon absorption, proportional counter, xenon filled multiwire counter, 2095
 - osteotomy, sawing, ultrasonics, welding, surgery, autopsy, rabbits, 1018
 - scalpel, midas rex, pneumatic device, 2680
- bone biopsy**, bone strength, bone hole, cadaver experiment, 1264
- bone cement**, acrylic acid, porous cement, 385
 - acrylic acid, fracture, stress fracture, fracture characteristics, 1624
 - antibiotic agent, oxacillin, poly(methacrylic acid methyl ester), high pressure insertion, 2
 - endoprosthesis, joint capsule, joint total replacement, macrophage, methacrylic acid methyl ester, wear product reaction, 1110
 - fracture external fixation, methacrylic acid methyl ester, 3359
 - gas chromatography, methacrylic acid, spectrophotometry, residue determination, 1623
- bone compression**, bone plate, osteosynthesis, bagley bone plte, case series, a self compressing bone plate, 3744
- bone conduction**, age, bekesy audiometry, stapes, automatic audiometry, grason stadler bekesy audiometer, 3480
 - audiometry, bone conductor, hearing aid, frequency response, 1099
 - audiometry, vibrator, calibration force level, 2 new vibrators, 3730
 - mastoid, model, 3130
- bone conductor**, audiometry, bone conduction, hearing aid, frequency response, 1099
- bone density**, aviation, helicopter pilot, skeleton, vibration, skeletal system, response, 3010
- bone disease**, bone stress, magnetic field, piezoelectricity, recording, non invasive method, 3005
- bone infection**, biomechanics, fracture, fracture external fixation, osteosynthesis, survey, 1109
- bone marrow**, analog model, mathematic model, 3282
- bone marrow cell**, cell, cross correlation, microscopy, multispectral cell image, 2307
- bone marrow smear**, computer, date processing, 3797
- bone mineral**, computer assisted tomography, photon absorption, dual energy tomography, 3445
- bone piezoelectric potential**, bone, collagen, femur, collagen crosslink, binding sequence, rat, 2066
 - ceramics, cortical bone, dielectric constant, silicon dioxide, titanin acid, ultrasonics, human, 75
 - collagen, mathematic model, piezoelectricity, stress generated potential, 79
 - mathematic model, piezoelectricity, bent long bone, 2068
 - osteon, piezoelectricity, skull, 2067
- bone plate**, bone compression, osteosynthesis, bagley bone plte, case series, a self compressing bone plate, 3744
- bone reconstruction**, long bone, osteoporosis, osteosynthesis, internal fixation plate, interdisciplinary approach, 886
- bone scintigraphy**, computer, methylene diphosphonate technetium tc 99m, technetium pyrophosphate tc 99m, computer assisted comparison of bone imaging, 350 patients, 2717
 - imaging system, scintillation camera, cleon imager, case series, 2155
- bone strength**, biomechanics, femur, stress, three dimensional analysis, human, 2028
 - bone, fatigue, model, stress, bone bending fatigue strength, human, 3139
 - bone, bone biopsy, bone hole, cadaver experiment, 1264
 - elasticity, long bone, tensile strength, tibia, dog, 429
 - hip arthrosis, ball deformation system, strength flow, 1135 cases, 2034
- bone stress**, bone disease, magnetic field, piezoelectricity, recording, non invasive method, 3005
 - centrifuge, femur, gravitational stress, weightlessness, 3g mouse, 2647
 - fixation, implant, joint total replacement, poly(methacrylic acid methyl ester), strength of bonding, cyclic tensile loading, 865
- b potential**, electoretinography, evoked visual response, skin electrode, normal subjects, 3357
- brachial angiography**, arteriography, arteriotomy, brachial artery, brain atherosclerosis, carotid artery, heart catheterization, neck, 258 cases, 3755
- brachial artery**, angiocardiology, catheter, heart catheterization, 700 cases, 3018

- arteriography, arteriotomy, brachial angiography, brain atherosclerosis, carotid artery, heart catheterization, neck, 258 cases, 3755
- artery flow, echography, noninvasive measurement, 603
- bradycardia**, apnea, microprocessor, monitoring, infant, 2715
- braille**, electronic calculator, low vision, 4 types, 539
- brain**, anesthesia, electroencephalography, intensive care, monitoring, 2676
 - angiography, blood vessel injury, decision theory, 1222
 - ascorbic acid, cerebrospinal fluid, computer, extracellular space, mannitol, pharmacokinetics, model, rabbit 859
 - blood vessel, brain depth injection, cannula, cerebrospinal fluid pressure, 677
 - brain cortex, copper, electromagnetic radiation, hypothalamus, iron, magnesium, potassium, sodium, zinc, 1600 mhz, rat, 2564
 - brain depth injection, brain transplantation, cannula, intracerebral injection, device, 3330
 - brain edema, brain tumor, computer assisted tomography, electron density, tomochemical analysis, 2740
 - brain hemorrhage, electricity, electric trauma, hydrocephalus, pneumoencephalography, subarachnoid hemorrhage, cat, dog, man of 25, 239
 - brain lesion, computer assisted tomography, head trauma, 100 pediatric cases, 3757
 - brain vascularization, computer assisted tomography, contrast intensification, normal tomogram, 2000 scans, 796
 - brain ventricle, echography, thalamus, two dimensional scanning of excised brain, normal anatomy, 1496
 - cannula, pneumoencephalography, stereotaxic surgery, substantia nigra, monkey, 2971
 - capacitance transducer, electromagnetic radiation, intracranial pressure, pressure transducer, telemetry, epidural implantation, 971
 - computer assisted tomography, dementia, diagnosis, overreliance, 1964
 - computer assisted tomography, cost effectiveness, 3077 scans, 3825
 - computer assisted tomography, skull, vertex scan, analysis 2000 examinations, 3838
 - computer model, nonlinear system, oxygen consumption, 2627
 - digital filtering, heart infarction, image processing, scintigraphy, scintillation camera, thermography, 1929
 - electrocoagulation, high frequency generator, 2865
 - electrode, nerve cell potential, film electrode probe, 2545
 - electroencephalography, magnetic field, mechanism, 1340
 - enzyme, homoprotocatechuic acid, microwave radiation, radiation hazard, rat, 3628
 - experimental animal, perfusion, tissue fixation, simple apparatus, whole animals, rodents, brain fixation, pressure control, 1073
 - head, microwave radiation, radiation hazard, cross polarized wave, mammal, 583
 - head holder, stereotaxic device, stereotaxic implantation, mouse, 2622
 - information processing, information science, nerve cell code, 489
 - liposome, liver, phosphatidylinositol, phospholipid exchange protein, beef, 397
 - mathematic model, memory, nerve cell network, associative memory, 3187
 - skull, ultrasonics, transmission ultrasound, thermal lesion, 2164
- brain abscess**, brain angiography, brain scintigraphy, computer assisted tomography, encephalitis, case, 377
 - brain angiography, computer assisted tomography, 22 cases, 785
 - brain hemorrhage, brain infarction, brain tumor, computer assisted tomography, encephalitis, meningitis, 80 children, 3462
 - brain scintigraphy, brain tumor, computer assisted tomography, meningioma, posterior fossa, subdural hematoma, review, 1194
 - computer assisted tomography, density, encephalopathy, glioblastoma, measurement of mean density, 798
 - computer assisted tomography, 60 patients, 1192
 - computer assisted tomography, empyema, epidural space, subdural empyema, 15 patients, 3438
- brain angiography**, angiography, computer assisted tomography, superior mesenteric angiography, method, case series, 1205
 - arteriovenous fistula, brain hematoma, brain hemorrhage, computer assisted tomography, 78 cases, 3845
 - arteriovenous malformation, brain arteriovenous fistula, computer assisted tomography, 22 cases, 361
 - atherosclerosis, basilar artery ectasia, computer assisted tomography, 4 cases, 363
 - backache, patient back pain reduction, 3770
 - brain abscess, brain scintigraphy, computer assisted tomography, encephalitis, case, 377
 - brain abscess, computer assisted tomography, 22 cases, 785
 - brain artery aneurysm, brain hematoma, computer assisted tomography, 56 patients, clinical study, 1193
 - brain artery aneurysm, brain vasospasm, cerebrovascular disease, computer, stethoscope, electronic stethoscope, 6 illustrative cases, 2162
 - brain artery aneurysm, brain scintigraphy, computer assisted tomography, pneumoencephalography, sella turcica tumor, sellar and parasellar lesions, 76 in 5000 cases, 2731
 - brain artery aneurysm, magnification angiography, direct serial magnification, 2672
 - brain cancer, brain scintigraphy, computer assisted tomography, glioma, case report, 3439

- brain edema, brain infarction, brain tumor, computer assisted tomography, survey, 1174
- brain falx, computer assisted tomography, epidural abscess, otitis media, subdural empyema, 11 yr old girl, neurosurgery, interhemispheric localization, 3062
- brain hemangioma, computer assisted tomography, hemangioma, 6 cases, 806
- brain scintigraphy, cerebrovascular accident, computer assisted tomography, stroke, review, 1587
- brain tumor, cerebellum tumor, computer assisted tomography, ependymoma, hemangioblastoma, medulloblastoma, 22 children, 3455
- brain tumor, computer assisted tomography, hypophysis tumor, ophthalmology, parasellar tumor, pneumoencephalography, sella turcica tumor, false negative diagnosis, 4 cases, 818
- computer assisted tomography, hypophysis adenoma, pneumoencephalography, 12 cases, 792
- brain aqueduct**, brain stem, brain tomography, computer assisted tomography, dorsum sellae, fourth brain ventricle, transverse cut, frontal cut, clivo parallel cut, method, human brain model, 2716
- computer assisted tomography, 5 cases, 1212
- brain arachnoid cyst**, brain cyst, cerebrospinal fluid, cisternography, computer assisted tomography, metrizamide, 4 cases, 3441
- computer assisted tomography, hydrocephalus, pneumoencephalography, sella turcica, third brain ventricle, case report, man of 19, neurosurgery, 1588
- brain arteriovenous fistula**, arteriovenous malformation, brain angiography, computer assisted tomography, 22 cases, 361
- brain artery**, arteriovenous fistula, artery clamp, stereotaxic surgery, clipping device, 1554
- artery, blood vessel muscle, mathematic model, medial brain artery, smooth muscle; orientation, 1080
- brain artery aneurysm**, arachnoiditis, brain hemorrhage, computer assisted tomography, subarachnoid hemorrhage, 8 cases, 1578
- brain angiography, brain hematoma, computer assisted tomography, 56 patients, clinical study, 1193
- brain angiography, brain vasospasm, cerebrovascular disease, computer, stethoscope, electronic stethoscope, 6 illustrative cases, 2162
- brain angiography, brain scintigraphy, computer assisted tomography, pneumoencephalography, sella turcica tumor, sellar and parasellar lesions, 76 in 5000 cases, 2731
- brain angiography, magnification angiography, direct serial magnification, 2672
- brain hemorrhage, brain tumor, central nervous system metastasis, chromophobe adenoma, computer assisted tomography, coronal and sagittal reconstruction, 3452
- computer assisted tomography, subarachnoid hemorrhage, 46 cases, 1579
- brain atherosclerosis**, arteriography, arteriotomy, brachial angiography, brachial artery, carotid artery, heart catheterization, neck, 258 cases, 3755
- carotid endarterectomy, doppler ultrasound flow meter, stroke, diagnosis, 2962
- brain atrophy**, alcoholism, alzheimer disease, computer assisted tomography, dementia, multiple sclerosis, parkinson disease, progressive multifocal leukoencephalopathy, schilder disease, survey, 358
- brain calcification, brain ischemia, brain tomography, brain tumor, computer assisted tomography, electroencephalography, partial epilepsy, porencephaly, 200 cases, 787
- brain hemorrhage, computer assisted tomography, head trauma, hydrocephalus, skull fracture, subdural hematoma, trauma, diagnosis, 1581
- brain scintigraphy, computer assisted tomography, melanodermic leukodystrophy, X chromosome recessive inheritance, 2 cases, 3816
- brain tumor, computer assisted tomography, leukoencephalopathy, progressive multifocal leukoencephalopathy, 3 cases, neuropathology, 2 autopsies, ultrastructure, diagnosis, 365
- cannabis, computer assisted tomography, drug abuse, no evidence, 19 patients, 1577
- central nervous system metastasis, computer assisted tomography, electroencephalography, encephalitis, epilepsy, partial epilepsy, tonic clonic epilepsy, 99 cases, 829
- computer assisted tomography, electroencephalography, epilepsy, head trauma, traumatic epilepsy, 78.070.297.P cases, 2330
- brain blood flow**, althesin, brain ischemia, brain scintigraphy, computer assisted tomography, xenon 133, 158 cases, 2730
- blood flow, hydraulic impedance, dog, 1305
- brain blood volume, brain infarction, brain scintigraphy, brain tumor, carotid artery obstruction, technetium 99m, transient ischemic attack, xenon 133, 43 cases, 2206
- brain cortex, xenon 133, woman of 40, sequential analysis, 3699
- brain cortex, consciousness, frontal lobe, schizophrenia, xenon 133, review, 49 references, 1074
- brain cortex, microelectrode, nerve cell, technique of recording, cat, hydrogen clearance method, 1085
- brain infarction, brain scintigraphy, brain tumor, camera, hydrocephalus, scintillation camera, subdural hematoma, method, diagnosis, 190
- brain scintigraphy, computer assisted tomography, edetic acid, gallium 68, krypton, positron emission tomography, positron scintiscanning, 120 cases, 799
- carbon dioxide tension, mathematic model, oxygen tension, 470
- cerebrospinal fluid, hypertension, 91 newborn infants, aplanation measurement, 2227

- cerebrovascular disease, computer, computer program, xenon 133, multiexponential curve fitting, 3482
- compartment model, computer, information processing, xenon 133, one line, 852
- compartment model, hydrogen, measurement, 1055
- computer, scintillation camera, xenon 133, methods, 3063
- computer assisted tomography, contrast medium, xenon, phantom study, monkey, 789
- computer assisted tomography, medial brain artery occlusion, xenon 133, monkey model, 1584
- computer assisted tomography, contrast intensification, xenon, baboon, 3461
- jugular vein, vein occlusion plethysmography, non invasive measurement, newborn infant, 1861
- brain blood volume**, brain blood flow, brain infarction, brain scintigraphy, brain tumor, carotid artery obstruction, technetium 99m, transient ischemic attack, xenon 133, 43 cases, 2206
- brain calcification**, brain atrophy, brain ischemia, brain tomography, brain tumor, computer assisted tomography, electroencephalography, partial epilepsy, porencephaly, 200 cases, 787
- brain cancer**, brain angiography, brain scintigraphy, computer assisted tomography, glioma, case report, 3439
- brain contusion**, cerebrovascular disease, computer assisted tomography, glioblastoma, hydrocephalus, meningioma, 1215
- brain cortex**, age, computer assisted tomography, hemianopia, hemiparesis, partial epilepsy, temporal lobe epilepsy, 11 out of 500 children, 788
 - brain, copper, electromagnetic radiation, hypothalamus, iron, magnesium, potassium, sodium, zinc, 1600 mhz, rat, 2564
 - brain blood flow, xenon 133, woman of 40, sequential analysis, 3699
 - brain blood flow, consciousness, frontal lobe, schizophrenia, xenon 133, review, 49 references, 1074
 - brain blood flow, microelectrode, nerve cell, technique of recording, cat, hydrogen clearance method, 1085
 - brain depth recording, brain pulsation, nerve cell potential, apparatus, pulsating brain, 669
 - brain oxygen tension, oxygen electrode, discrete brain cortex volume, rabbit, 1003
 - brain white matter, computer assisted tomography, differentiation, 360
 - cooling, peltier effect, thermode, local cooling, 2974
 - electrocardiography, hippocampus, hippocampus potential, mathematic model, dorsal hippocampus slope, 2476
 - electrocorticography, electroencephalography, mathematic model, meninx, source tangential layer, 492
 - electroencephalography, electroencephalography electrode, seizure, laminar exploration, skin film technology, 555
 - nerve cell potential, signal noise ratio, signal processing, spike train, extracellular recording, 2083
- brain cortex steady potential**, electrode, mercurous chloride, spreading cortical depression, rat, 2230
- brain cyst**, atomic number, colloid cyst, computer assisted tomography, electron density, method, 12 cases, 2333
 - brain arachnoid cyst, cerebrospinal fluid, cisternography, computer assisted tomography, metrizamide, 4 cases, 3441
 - brain tumor, cerebrospinal fluid, computer assisted tomography, absorption coefficient, 11 cases, differential diagnosis, 2340
 - computer assisted tomography, porencephaly, 8 cases, 815
- brain death**, cancer, cerebrovascular disease, echoencephalography, echography, echotomography, ultrasonics, survey, 1826
- brain depth injection**, blood vessel, brain, cannula, cerebrospinal fluid pressure, 677
 - brain, brain transplantation, cannula, intracerebral injection, device, 3330
- brain depth recording**, alpha rhythm, electroencephalography, 81
 - anesthesia, artificial ventilation, positive pressure ventilation, small animals, rat, 1484
 - behavior, brain depth stimulation, stereotaxic implantation, stimulator, iguana, 243
 - brain cortex, brain pulsation, nerve cell potential, apparatus, pulsating brain, 669
 - brain depth stimulation, electrocorticography, electrode, for use in human, 680
 - brain depth stimulation, electrode, insulating device, 240
 - brain depth stimulation, electrode, videorecording, electrode location, animal, 3726
 - brain depth stimulation, commutator, electrocardiography, lightweight, multi contact, 2966
 - cerebellum, microelectrode, stereotaxic implantation, awake, cat, 1075
 - hypothalamus, micropipette, recording barrel, method description, guinea pig, 3268
 - microelectrode, nerve cell potential, floating mobile electrode, frog, 246
- brain depth stimulation**, antenna, chemotherapy, microwave radiation, radiation hazard, stereotaxis, 2172
 - behavior, brain depth recording, stereotaxic implantation, stimulator, iguana, 243
 - brain depth recording, electrocorticography, electrode, for use in human, 680
 - brain depth recording, electrode, insulating device, 240
 - brain depth recording, electrode, videorecording, electrode location, animal, 3726
 - brain depth recording, commutator, electrocardiography, lightweight, multi contact, 2966
 - brain edema, electrode, electrode impedance, glucocorticosteroid, mannitol, seizure, somatomotor epilepsy, visual cortex, cat, 1489
 - cerebrospinal fluid, electrolysis, platinum electrode, non gassing limit, 2090

- cochlea microphonic potential, olivocochlear tract, summating, guinea pig, 2617
- corrosion, electrostimulation, needle electrode, nervous system, biphasic stimulation, 2228
- electrode, in vitro model, 3322
- electroencephalography, electrosleep, sleep, stimulation, need activation, artificial sleep, 1499
- electroencephalography electrode, stimulation threshold, striate cortex, visual cortex, visual prosthesis, macaque monkey, 1072
- electrostimulation, implantation, power supply, lateral hypothalamus, constant current, rat, 3332
- electrostimulation, implant, platinum electrode, electrode area, 2086
- lateral hypothalamus, medial forebrain bundle, nerve cell potential, strength duration curve, rat, 3182
- sine wave stimulation, solid state, 2624
- brain edema**, ammonium, aspartate aminotransferase blood level, computer, electroencephalography, encephalopathy, exchange blood transfusion, fatty liver, furosemide, mannitol, reye syndrome, 7 children, 779
- brain, brain tumor, computer assisted tomography, electron density, tomochemical analysis, 2740
- brain angiography, brain infarction, brain tumor, computer assisted tomography, survey, 1174
- brain depth stimulation, electrode, electrode impedance, glucocorticosteroid, mannitol, seizure, somatomotor epilepsy, visual cortex, cat, 1489
- brain hernia, brain tumor, computer assisted tomography, metastasis, ascending transtentorial herniation, 7 cases, 3837
- brain ventricle, cerebrospinal fluid, computer assisted tomography, ependyma, hydrocephalus, 4 patients, transependymal csf absorption, 2736
- cerebrospinal fluid, electroencephalography, head trauma, hematoma, intracranial hypertension, tumor, cat, epidural pressure measurement, 1076
- brain falx**, brain angiography, computer assisted tomography, epidural abscess, otitis media, subdural empyema, 11 yr old girl, neurosurgery, interhemispheric localization, 3062
- brain hemangioma**, brain angiography, computer assisted tomography, hemangioma, 6 cases, 806
- brain hematoma**, aged, brain infarction, brain tumor, cerebrovascular accident, computer assisted tomography, stroke, subdural hematoma, diagnostic value, 3830
- arteriovenous fistula, brain angiography, brain hemorrhage, computer assisted tomography, 78 cases, 3845
- brain angiography, brain artery aneurysm, computer assisted tomography, 56 patients, clinical study, 1193
- brain hemorrhage, computer assisted tomography, echoencephalography, electroencephalography, 33 patients, 2720
- brain stem compression, cerebellum hemorrhage, computer assisted tomography, hypertension, neurosurgery, 10 cases, 3827
- brain stem contusion, coma, computer assisted tomography, head trauma, hygroma, 1000 consecutive patients, 1582
- brain tumor, computer assisted tomography, headache, head trauma, hydrocephalus, mental deficiency, seizure, 795
- computer assisted tomography, stereotaxic surgery, case report, screw action technique, 3453
- brain hemorrhage**, arachnoiditis, brain artery aneurysm, computer assisted tomography, subarachnoid hemorrhage, 8 cases, 1578
- arteriovenous fistula, brain angiography, brain hematoma, computer assisted tomography, 78 cases, 3845
- brain, electricity, electric trauma, hydrocephalus, pneumoencephalography, subarachnoid hemorrhage, cat, dog, man of 25, 239
- brain abscess, brain infarction, brain tumor, computer assisted tomography, encephalitis, meningitis, 80 children, 3462
- brain artery aneurysm, brain tumor, central nervous system metastasis, chromophobe adenoma, computer assisted tomography, coronal and sagittal reconstruction, 3452
- brain atrophy, computer assisted tomography, head trauma, hydrocephalus, skull fracture, subdural hematoma, trauma, diagnosis, 1581
- brain hematoma, computer assisted tomography, echoencephalography, electroencephalography, 33 patients, 2720
- brain hernia, brain tumor, computer assisted tomography, transtentorial herniation, 4 cases, 766
- brain tumor, brain ventricle, computer assisted tomography, stroke, 3454
- computer assisted tomography, epidural hemorrhage, subdural hematoma, attenuation value, 14 cases, 800
- computer assisted tomography, head trauma, meningorrhagia, 1173
- computer assisted tomography, 83 cases, diagnosis, 819
- computer assisted tomography, transient ischemic attack, 6 cases, 3846
- computer assisted tomography, hematoma, ring blush, 7 cases in 58, 362
- brain hernia**, brain edema, brain tumor, computer assisted tomography, metastasis, ascending transtentorial herniation, 7 cases, 3837
- brain hemorrhage, brain tumor, computer assisted tomography, transtentorial herniation, 4 cases, 766
- brain homogenate**, synapse vesicle, decanting device, 1885
- brain hypothermia**, cerebellum, motor cortex, cooling probe, coding device, 3524

- brain impedance**, electrode, specific impedance measurement, human, 1807
- brain infarction**, acoustic nerve neurinoma, brain tumor, computer assisted tomography, posterior cranial fossa tumor, 191 cases, 3835
 - aged, brain hematoma, brain tumor, cerebrovascular accident, computer assisted tomography, stroke, subdural hematoma, diagnostic value, 3830
 - aphasia, computer assisted tomography, embolism, medial brain artery, stroke, 60 cases, 1195
 - brain abscess, brain hemorrhage, brain tumor, computer assisted tomography, encephalitis, meningitis, 80 children, 3462
 - brain angiography, brain edema, brain tumor, computer assisted tomography, survey, 1174
 - brain blood flow, brain blood volume, brain scintigraphy, brain tumor, carotid artery obstruction, technetium 99m, transient ischemic attack, xenon 133, 43 cases, 2206
 - brain blood flow, brain scintigraphy, brain tumor, camera, hydrocephalus, scintillation camera, subdural hematoma, method, diagnosis, 190
 - brain tumor, computer assisted tomography, sella turcica, skull base, sagittal and coronal scan, 3824
 - brain tumor, computer assisted tomography, contrast intensification, subtraction method, 19 cases, 2733
- brain ischemia**, althesin, brain blood flow, brain scintigraphy, computer assisted tomography, xenon 133, 158 cases, 2730
 - brain atrophy, brain calcification, brain tomography, brain tumor, computer assisted tomography, electroencephalography, partial epilepsy, porencephaly, 200 cases, 787
 - computer assisted tomography, head trauma, hydrocephalus, 457 cases, 833
 - skin temperature, sympathetic nerve, thermography, new apparatus, 2563
- brain lesion**, brain, computer assisted tomography, head trauma, 100 pediatric cases, 3757
 - computer assisted tomography, neurinoma, spinal cord lesion, syringomyelia, diagnosis, 1190
 - model, 2811
- brain malformation**, brain tumor, computer assisted tomography, congenital malformation, histogenesis, organogenesis, skull defect, computed tomography, indication, 1223
- brain mapping**, electroencephalography, topography, method, 927
- brain oxygen tension**, brain cortex, oxygen electrode, discrete brain cortex volume, rabbit, 1003
- brain pseudotumor**, computer assisted tomography, lead encephalopathy, lead poisoning, case report, 816
- brain pulsation**, brain cortex, brain depth recording, nerve cell potential, apparatus, pulsating brain, 669
- brain scintigraphy**, althesin, brain blood flow, brain ischemia, computer assisted tomography, xenon 133, 158 cases, 2730
 - brain abscess, brain angiography, computer assisted tomography, encephalitis, case, 377
 - brain abscess, brain tumor, computer assisted tomography, meningioma, posterior fossa, subdural hematoma, review, 1194
 - brain angiography, brain cancer, computer assisted tomography, glioma, case report, 3439
 - brain angiography, cerebrovascular accident, computer assisted tomography, stroke, review, 1587
 - brain angiography, brain artery aneurysm, computer assisted tomography, pneumoencephalography, sella turcica tumor, sellar and parasellar lesions, 76 in 5000 cases, 2731
 - brain atrophy, computer assisted tomography, melanodermic leukodystrophy, X chromosome recessive inheritance, 2 cases, 3816
 - brain blood flow, computer assisted tomography, edetic acid, gallium 68, krypton, positron emission tomography, positron scintiscanning, 120 cases, 799
 - brain blood flow, brain blood volume, brain infarction, brain tumor, carotid artery obstruction, technetium 99m, transient ischemic attack, xenon 133, 43 cases, 2206
 - brain blood flow, brain infarction, brain tumor, camera, hydrocephalus, scintillation camera, subdural hematoma, method, diagnosis, 190
 - brain tumor, computer assisted tomography, pertechnetate acid tc 99m, comparison, 190 cases, 1183
 - brain tumor, computer assisted tomography, glioma, multifocal glioma, case, 2338
 - computer assisted tomography, heart infarction, scintillation camera, technetium 99m, 25 cases, dog heart infarction, emission computed tomography, maac 99m, 1200
- brain section**, computer, nerve cell network, neuron tree reconstruction from several sections, 3854
 - guillotine, odd plane sections, mouse, 3326
- brain stem**, acoustic impedance, neurootology, pons angle tumor, stapes reflex, diagnostic value, 1683
 - brain aqueduct, brain tomography, computer assisted tomography, dorsum sellae, fourth brain ventricle, transverse cut, frontal cut, clivo parallel cut, method, human brain model, 2716
 - evoked response audiometry, young children, 271
- brain stem compression**, brain hematoma, cerebellum hemorrhage, computer assisted tomography, hypertension, neurosurgery, 10 cases, 3827
- brain stem contusion**, brain hematoma, coma, computer assisted tomography, head trauma, hygroma, 1000 consecutive patients, 1582
- brain sulcus**, age, brain ventricle, computer assisted tomography, third brain ventricle, cella media, 100 normal adults, 3443
- brain tomography**, brain aqueduct, brain stem, computer assisted tomography, dorsum sellae,

- fourth brain ventricle, transverse cut, frontal cut, clivo parallel cut, method, human brain model, 2716
- brain atrophy, brain calcification, brain ischemia, brain tumor, computer assisted tomography, electroencephalography, partial epilepsy, porencephaly, 200 cases, 787
- computer assisted tomography, diatrizoate, case series, 791
- computer assisted tomography, meningioma, optic nerve, visual field defect, woman of 44, 1586
- computer assisted tomography, contrast intensification, resolving power, 2346
- brain transplantation**, brain, brain depth injection, cannula, intracerebral injection, device, 3330
- brain tumor**, acoustic nerve neurinoma, brain infarction, computer assisted tomography, posterior cranial fossa tumor, 191 cases, 3835
- aged, brain hematoma, brain infarction, cerebrovascular accident, computer assisted tomography, stroke, subdural hematoma, diagnostic value, 3830
- astrocytoma, central nervous system metastasis, computer assisted tomography, craniopharyngioma, hypophysis adenoma, meningioma, 1658 cases, 817
- brain, brain edema, computer assisted tomography, electron density, tomochemical analysis, 2740
- brain abscess, brain scintigraphy, computer assisted tomography, meningioma, posterior fossa, subdural hematoma, review, 1194
- brain abscess, brain hemorrhage, brain infarction, computer assisted tomography, encephalitis, meningitis, 80 children, 3462
- brain angiography, cerebellum tumor, computer assisted tomography, ependymoma, hemangioblastoma, medulloblastoma, 22 children, 3455
- brain angiography, brain edema, brain infarction, computer assisted tomography, survey, 1174
- brain angiography, computer assisted tomography, hypophysis tumor, ophthalmology, parasellar tumor, pneumoencephalography, sella turcica tumor, false negative diagnosis, 4 cases, 818
- brain artery aneurysm, brain hemorrhage, central nervous system metastasis, chromophobe adenoma, computer assisted tomography, coronal and sagittal reconstruction, 3452
- brain atrophy, brain calcification, brain ischemia, brain tomography, computer assisted tomography, electroencephalography, partial epilepsy, porencephaly, 200 cases, 787
- brain atrophy, computer assisted tomography, leukoencephalopathy, progressive multifocal leukoencephalopathy, 3 cases, neuropathology, 2 autopsies, ultrastructure, diagnosis, 365
- brain blood flow, brain blood volume, brain infarction, brain scintigraphy, carotid artery obstruction, technetium 99m, transient ischemic attack, xenon 133, 43 cases, 2206
- brain blood flow, brain infarction, brain scintigraphy, camera, hydrocephalus, scintillation camera, subdural hematoma, method, diagnosis, 190
- brain cyst, cerebrospinal fluid, computer assisted tomography, absorption coefficient, 11 cases, differential diagnosis, 2340
- brain edema, brain hernia, computer assisted tomography, metastasis, ascending transtentorial herniation, 7 cases, 3837
- brain hematoma, computer assisted tomography, headache, head trauma, hydrocephalus, mental deficiency, seizure, 795
- brain hemorrhage, brain ventricle, computer assisted tomography, stroke, 3454
- brain hemorrhage, brain hernia, computer assisted tomography, transtentorial herniation, 4 cases, 766
- brain infarction, computer assisted tomography, sella turcica, skull base, sagittal and coronal scan, 3824
- brain infarction, computer assisted tomography, contrast intensification, subtraction method, 19 cases, 2733
- brain malformation, computer assisted tomography, congenital malformation, histogenesis, organogenesis, skull defect, computed tomography, indication, 1223
- brain scintigraphy, computer assisted tomography, pertechnetate acid tc 99m, comparison, 190 cases, 1183
- brain scintigraphy, computer assisted tomography, glioma, multifocal glioma, case, 2338
- cerebrospinal fluid, electrocardiography, electroencephalography, hematoma, intracranial hypertension, pneumoencephalography, telemetry, 20 cases, continuous recording, technique, 1487
- cisternography, computer assisted tomography, metrizamide, suprasellar mass, 10 cases, 1589
- computer assisted tomography, radiotherapy, 26 cases, 3814
- computer assisted tomography, contrast intensification, diatrizoate, case series, 3079
- computer assisted tomography, stereotaxic surgery, 52 cases, 3078
- computer assisted tomography, infratentorial tumor, posterior cranial fossa tumor, 51 cases, 1187
- computer assisted tomography, image processing, digital display, 1590
- computer assisted tomography, diatrizoate, glioma, hypophysis adenoma, meningioma, non contrast scanning, 299 cases, 3457
- computer assisted tomography, electroencephalography, 111 cases, 1574
- computer assisted tomography, orbit tumor, histographic analysis, 88 tumors, 1213
- computer assisted tomography, 72 patients, diagnosis, 1204
- computer assisted tomography, hydrocephalus, pneumoencephalography, 725 scans, 757
- computer assisted tomography, pineal body, pinealoma, 8 cases, classification, 2732
- computer assisted tomography, radiotherapy, evaluation therapeutically induced changes, 25 cases, 3072

- computer assisted tomography, epidermoid tumor, 2 cases, 364
- computer assisted tomography, 6000 cases, 767
- eye movement, malignant exophthalmos, muscle disease, myasthenia gravis, oculomotor paralysis, 118 cases, micromovement recording device, 270
- brain vascularization**, artificial embolism, balloon, carotid arteriography, technical note, 3327
- brain, computer assisted tomography, contrast intensification, normal tomogram, 2000 scans, 796
- brain vasospasm**, brain angiography, brain artery aneurysm, cerebrovascular disease, computer, stethoscope, electronic stethoscope, 6 illustrative cases, 2162
- brain ventricle**, age, computer assisted tomography, sex, 170 examinations, age, sex, 3444
- age, brain sulcus, computer assisted tomography, third brain ventricle, cella media, 100 normal adults, 3443
- brain, echography, thalamus, two dimensional scanning of excised brain, normal anatomy, 1496
- brain edema, cerebrospinal fluid, computer assisted tomography, ependyma, hydrocephalus, 4 patients, transependymal csf absorption, 2736
- brain hemorrhage, brain tumor, computer assisted tomography, stroke, 3454
- brain ventriculography, computer assisted tomography, echoencephalography, 192 cases, 1585
- cannulation, consciousness, gonadotropin, growth hormone blood level, prolactin blood level, method, dual cannulation, awake rat, 671
- cerebrospinal fluid shunting, computer assisted tomography, hydrocephalus, porencephaly, 4 cases, motor deficit, 1575
- computer assisted diagnosis, computer assisted tomography, hydrocephalus, volume determination, 805
- computer assisted tomography, 1211
- brain ventriculography**, brain ventricle, computer assisted tomography, echoencephalography, 192 cases, 1585
- brain white matter**, brain cortex, computer assisted tomography, differentiation, 360
- cerebellum, computer assisted tomography, posterior fossa, cerebellum white matter, 3821
- computer assisted tomography, demyelination, multiple sclerosis, optic nerve, 100 cases, diagnosis, 3829
- breast**, diagnosis, information processing, thermography, 1940
- breast biopsy**, computer, data base, diagnosis, mammography, pathology, radiography, interclinical cross check, 708 cases, austria, 3430
- breast cancer**, age, cancer incidence, cancerogenesis, epidemiology, menarche, menopause, stochastic model, 2768
- blood flow, cancer screening, doppler ultrasound flow meter, ultrasonics, 3015
- chronic disease, mammography, mass screening, model, periodic medical examination, mathematical analysis, transient analysis, screening interval, 1250
- classification, computer assisted diagnosis, medical record, treatment selection, 26 cases, 761
- breast carcinoma**, cancer, mathematic model, survival, 1642
- computer, echotomography, mammography, time of flight echography, 3809
- computer, radiotherapy, therapy, computer aided medical decision making, 25 cases, 1593
- computer, thermography, computer thermography, 356
- breath analysis**, argon 37, calcium, xenon 133, recirculating breath collection system, effect on exhalation rate, 3640
- breathing**, airway impedance, lung impedance, lung pressure, healthy man, 3304
- arterial carbon dioxide tension, lung ventilation, tidal volume, time series, cluster analysis, dog, 2954
- catheter, esophagus pressure, catheter choosing, 3270
- energy expenditure, energy transfer, oxygen consumption, mathematic model, calculation, 3681
- mathematic model, nerve conduction, vagus nerve, rhythmogenesis, lotka volterra model, 467
- breathing apparatus**, filter, gas mask, industrial hygiene, respirator absorbent filters, characterization, 649
- breathing mechanics**, airway resistance, breathing muscle, breathing work, mathematic model, force velocity relationship, 1271
- airway resistance, lung compliance, measurement device, 2217
- algorithm, calculator, computer, programmable calculator, 2378
- amniotic fluid, echography, fetus, lung, time distance recorder, 2163
- breathing muscle**, airway resistance, breathing mechanics, breathing work, mathematic model, force velocity relationship, 1271
- computer, diaphragm, digital computer, lung, lung volume, rabbit, 1994
- breathing rate**, electrocardiography, heart rate, lung ventilation, sailor, ship, skin temperature, telemetry, workload, seagoing ship, 524
- lung alveolus, lung pressure, mathematic model, model, 2830
- breathing work**, airway resistance, breathing mechanics, breathing muscle, mathematic model, force velocity relationship, 1271
- body temperature, compartment model, lung ventilation perfusion ratio, panting, respiration control, thermoregulation, dog, 1699
- brems radiation**, aluminum, roentgen apparatus, 60-140 kv, 725
- beta radiation, photochemistry, evaluation, 589

- megavoltage radiotherapy, material choice, 3248
- megavoltage radiotherapy, spectrometry, half value layer, 5-40 mev, 587
- brightness**, color vision, mathematic model, visual system, brightness generation, 1693
- bromsulphophthalein**, bile, computer model, drug interaction, pharmacokinetics, warfarin, 3498
- bronchial asthma**, aerosol, asepsis, bacterial pollution, fungus, infection, risk, 27 apparatuses, 18 subjects, mobile use, 1478
 - air flowmeter, airway obstruction, forced expiration, histamine, simple device, 3710
- bronchography**, computer assisted tomography, contrast medium, krypton, lung ventilation, xenon, phantom study, 790
- bronchus**, ciliary motility, computer, trachea, dogs, new measuring technique, 1237
- bronchus tree**, airway, airway resistance, entropy, lung vascular resistance, mathematic model, respiration, morphology, branching tree, 434
- bruising**, radiotherapy, ultrasonics, guinea pig, 3785
- b scan**, abdomen, echography, continuous raster scanning, 1429
 - a scan, echooculography, m scan, ultrasonics, new device, 2167
 - congenital heart malformation, echocardiography, echotomography, heart disease, high speed b mode echocardiography, 500 cases, 1435
 - echography, ultrasonics, speckle, 3678
 - echography, ultrasonics, grey scale, 2276
- bubble**, air, argon, gas exchange, nitrogen, bubble formation measurement, 1348
 - artery, aspirator, vein, bubble removing, 1048
- bubble oxygenator**, SEE oxygenator
- buffer**, antimony, bicarbonate, carbon dioxide, carbon dioxide tension, hydrogen ion, microelectrode, oxygen tension, antimony microelectrode, 165
- bullae**, exudate, histamine, inflammation, kinin, prostaglandin, skin, recovery, method, 3363
- burn**, accident, catheter, fire risk, nasogastric tube, oxygen breathing, case, 229
 - echography, thermal trauma, determination, 2264
 - electric trauma, electrocoagulation, intestine trauma, laparoscopy, uterine tube, uterine tube sterilization, 659
 - electrocardiography, electrode, monitoring, operating room, 3033
 - evaporation, heat radiation, mathematic model, skin, temperature distribution, 2040
- cable**, model, myelination, nerve fiber, saltatory conduction, test theory, 1727
- cadaver**, biological model, biomechanics, injury, thorax, 3137
- cadaver identification**, computer, forensic odontology, record storage, identification method, 1556
- caffeine**, calcium, cell membrane, egg, methyladenine, oogenesis, theobromine, theophylline, hormone surface interaction, scanning electron microscopy, starfish, 3716
- calcification**, calcium blood level, electron microscopy, scanning electron microscopy, serum, 204
- calcified tissue**, calcium phosphate hydroxide, collagen, elasticity, 1670
- calcium**, actin, actomyosin, adenosine triphosphatase, model, muscle, myosin, quantitative model, 890
 - adenosine triphosphate, cell membrane, cell membrane permeability, model, sodium, transport mechanism, 2011
 - argon 37, breath analysis, xenon 133, recirculating breath collection system, effect on exhalation rate, 3640
 - caffeine, cell membrane, egg, methyladenine, oogenesis, theobromine, theophylline, hormone surface interaction, scanning electron microscopy, starfish, 3716
 - endplate potential, magnesium, mathematic model, neuromuscular synapse, non linear summation, martin formula, frog, 3196
 - glycerol, muscle fiber, troponin, psoas muscle, filament overlap, rabbit, 3146
 - illumination, photoreceptor, visual cell, activity change, cattle, 458
 - magnesium adenosine triphosphate, muscle contraction, muscle model, muscle relaxation, rabbit, 45
 - mathematic model, nerve cell membrane conductance, pacemaker nerve cell, 3554
 - may hegglin malformation, thrombocyte, normal values, method, atomic absorption spectrometry, 618
 - molecular structure, nerve fiber membrane, sodium conductance, squid, 3552
 - muscle fiber membrane, myotonia, mathematic model, 1672
- calcium 45**, heart muscle, sucrose c 14, diffusion in transient and steady state, kittens, 2005
- calcium adenosine triphosphatase**, cell membrane, lipid membrane, membrane protein, rhodopsin, 404
- calcium blood level**, calcification, electron microscopy, scanning electron microscopy, serum, 204
- calcium channel**, heart muscle cell membrane, heart muscle cell membrane potential, heart vulnerable period, sodium channel, 2845
 - heart muscle fiber, procaine, propranolol, sodium channel, verapamil, cat, 2412
- calcium electrode**, chloride electrode, ion exchange, magnesium electrode, microelectrode, potassium electrode, physicochemistry, 1343
- calcium fluoride dosimeter**, lithium fluoride dosimeter, neutron radiation, radiotherapy,

- thermoluminescence dosimeter, 1920
- calcium hydroxide**, membrane permeability, membrane potential, konjak membrane, 2388
- calcium phosphate hydroxide**, calcified tissue, collagen, elasticity, 1670
- calcium pump**, adenosine triphosphate, cell membrane, sarcoplasmic reticulum, 405
- calculation**, bicycle ergometry, heart function test, oxygen consumption, step test, cylinder, 646
 - blood gas, blood volume, extracorporeal circulation, calculation model sr-52, 3706
- calculator**, algorithm, breathing mechanics, computer, programmable calculator, 2378
 - cancer staging, multiple myeloma, mathematic model, calculator program, pocket calculator, 330
 - drug screening, toxicology, programmable calculator, 3791
 - histogram, microcomputer, nerve cell potential, 2234
 - oxygen saturation, oxygen tension, 1159
 - selection guide, 2127
- calf**, thrombosis, vein blood flow, external pressure, 11 normals, 2202
- californium 252**, dosimetry, ionization chamber, roentgen dose distribution, liquid dielectric ionization chamber, 300
- callus**, electret, fracture, electrodynamic callus, electrostatic callus, rat, 1528
- caloric intake**, computer, nutrient, nutrition, protein, intake estimation, 842
- caloric vestibular test**, electronystagmography, electrooculography, apparatus, 252
- calorimetry**, body temperature, heat clearance, microwave radiation, radiation hazard, mice, 2433
 - carbon dioxide laser, laser, power measurement, CO₂ laser, 174
 - chemical kinetics, micro calorimeter, differential calorimeter, 149
 - computer assisted tomography, dosimetry, echography, ultrasonics, megahertz frequency, 1197
 - energy transfer, oxygen consumption, 24 hrs, direct and indirect measurement, 3635
 - measurement, specific heat, low temperature calorimeter, 1798
 - phase transition, alternating current, 3617
- camera**, abdominal viscera, estrus, implantation, solid state camera, sheep, 1782
 - brain blood flow, brain infarction, brain scintigraphy, brain tumor, hydrocephalus, scintillation camera, subdural hematoma, method, diagnosis, 190
 - ergonomics, tilting, tremor, 2131
 - focal point, radiography, focal spot camera, 3767
 - image processing, pattern recognition, 3589
 - lens, modulation transfer function, zoom lens, 3590
 - mathematic model, modulation transfer function, scintigraphy, scintillation, statistics, 1921
 - motor activity, x,y coordinate recording, 957
 - oscilloscope, photography, frame numbering device, 533
 - pattern recognition, space variant pattern, 3226
 - shutter, shutter control, 536
- camphorquinone**, holography, image processing, light absorption, organic medium, 128
- cancer**, beam profile, cobalt therapy, dosimetry, phantom, 3433
 - beam profile, pion radiation, radiotherapy, roentgen dose distribution, 3431
 - brain death, cerebrovascular disease, echoencephalography, echography, echotomography, ultrasonics, survey, 1826
 - breast carcinoma, mathematic model, survival, 1642
 - cancer chemotherapy, diagnosis, mathematic model, radiotherapy, statistics, therapy evaluation, 2361
 - computer, neutron therapy, radiotherapy, roentgen dose distribution, G.D.R., 1976
 - computer, cancer registry system, Canada, 2684
 - computer, radiotherapy, roentgen dose distribution, 3064
 - computer assisted tomography, radiotherapy, diagnostic role, 809
 - computer assisted tomography, radiotherapy, whole body scanning, treatment planning, follow up, 167 cases, 2345
 - computer model, image processing, information processing, scintigraphy, normal brain, 2341
 - computer program, drug half life, folinate calcium, kidney failure, mathematic model, methotrexate, pharmacokinetics, 5 patients, 3435
 - hyperthermia, thermometry, localized hyperthermia, 3525
 - population model, sampling, statistics, survival, truncated data, censored sample, 2403
- cancer cell**, cell membrane, protein bound iodine 125, binding, device, novikoff tumor cells, 947
- cancer chemotherapy**, algorithm, drug dose, hodgkin disease, pharmacotherapy, oncology center, 351
 - cancer, diagnosis, mathematic model, radiotherapy, statistics, therapy evaluation, 2361
 - cancer graft, cancer growth, carcinomatous meningitis, walker carcinoma, rat model, histopathology, screening of antineoplastic agents, 398
 - cell cycle, deoxyribonucleic acid, drug dose, drug resistance, system analysis, model, mouse, 783
 - computer, decision, methotrexate, 100 patients, 3053
 - immunoglobulin g, multiple myeloma, optimal control analysis, gompertzian model, mathematical model, 782

cancer cytodiagnosis, bladder carcinoma, cell dedifferentiation, computer, urogenital tract, unsupervised learning algorithms, 1156

- bladder carcinoma, cell dedifferentiation, computer, urogenital tract, supervised learning algorithms, classification, 1155
- computer, microspectrophotometry, uterine cervix carcinoma, uterine cervix cytology, cytologic automation, papanicolaou staining, 109 free lying cells, 332
- computer, cytology, data base, simple system, histologic control, 1936

cancer diagnosis, computer assisted diagnosis, lung carcinoma, thorax radiography, 482 cases, 2724

cancer graft, cancer chemotherapy, cancer growth, carcinomatous meningitis, walker carcinoma, rat model, histopathology, screening of antineoplastic agents, 398

- cancer growth, magnetic field, necrosis, neuroblastoma, alternating magnetic field, mice, tumor c 1300, 1396

cancer growth, cancer chemotherapy, cancer graft, carcinomatous meningitis, walker carcinoma, rat model, histopathology, screening of antineoplastic agents, 398

- cancer graft, magnetic field, necrosis, neuroblastoma, alternating magnetic field, mice, tumor c 1300, 1396
- computer program, information processing, mathematic model, statistics, gompertz function, fortran, 2782
- growth, mathematic model, stability analysis, 2003

cancer incidence, age, breast cancer, cancerogenesis, epidemiology, menarche, menopause, stochastic model, 2768

cancerogenesis, age, breast cancer, cancer incidence, epidemiology, menarche, menopause, stochastic model, 2768

- autopsy, cancer research, computer, data base, mouse strain, organ, pathology, national center for toxicological research, usa, automated pathology information system, 1158
- cell metabolism, chemical kinetics, mathematic model, 2014
- computer program, dose response, nuclear radiation, radiotherapy, value, 2331

cancer research, autopsy, cancerogenesis, computer, data base, mouse strain, organ, pathology, national center for toxicological research, usa, automated pathology information system, 1158

cancer screening, blood flow, breast cancer, doppler ultrasound flow meter, ultrasonics, 3015

cancer staging, abdominal cancer, computer assisted tomography, lymphography, malignant lymphoma, 30 cases, 1601

- bladder carcinoma, computer assisted tomography, experience, 786
- calculator, multiple myeloma, mathematic model, calculator program, pocket calculator, 330

cancer surgery, electrode, electrosurgery, new instruments, 2681

cannabis, brain atrophy, computer assisted tomography, drug abuse, no evidence, 19 patients, 1577

cannula, artery, no kinking, 2939

- blood vessel, brain, brain depth injection, cerebrospinal fluid pressure, 677
- brain, pneumoencephalography, stereotaxic surgery, substantia nigra, monkey, 2971
- brain, brain depth injection, brain transplantation, intracerebral injection, device, 3330

cannulation, brain ventricle, consciousness, gonadotropin, growth hormone blood level, prolactin blood level, method, dual cannulation, awake rat, 671

- continuous infusion, thoracic duct, mice, procedure, 1839

capacitance transducer, brain, electromagnetic radiation, intracranial pressure, pressure transducer, telemetry, epidural implantation, 971

- parkinson disease, tremor, measuring device, variable, 2963

capillary, capillary flow, erythrocyte, mathematic model, oxygen transport, 461

- fiberglass, microelectrode, micropipette, fiberglass filament introducing, 501

capillary flow, aorta flow, circulation, model, vein blood flow, 919

- arteriole, blood pressure, centrifuge, gravitation, noradrenalin, 2 g centrifugation, second generation rats, carotid artery, mesentery arteriole, 716
- atherosclerosis, diabetes mellitus, hypertension, microscopy, skin capillary, television, vital television capillary microscopy, 3285
- blood flow, doppler ultrasound flow meter, laser, laser doppler measurement, 3694
- blood flow, blood pressure, infrared radiation, rheology, 3288
- capillary, erythrocyte, mathematic model, oxygen transport, 461
- heart muscle blood flow, isotope tracing, model, physiology, theory of tracer washout technique, 2929
- mathematic model, conductivity index, 1706
- pulsatile flow, skin capillary, flow measurement, 1383
- videorecording, recording system, 3623

capillary permeability, blood viscosity, hematocrit, mathematic model, serum protein, 3541

capillary pressure, liver blood flow, liver capillary, liver vascular resistance, mathematic model, dog, 2062

capnography, end tidal carbon dioxide tension, monitoring, 3396

capsule, endoneurium pressure, interstitial fluid, lead, nerve fiber, polyethylene, sciatic nerve, rat, 151

carbon, electrode, electrode impedance, glassy carbon electrodes, 999

- heart valve prosthesis, hemodynamics, hemolysis, pivoting disc prosthesis, carbon model, 1459

carbon 14, artificial kidney, hemodialysis, cold carbon apparatus, 2223

- environmental contamination, nuclear power plant, population exposure, radioactivity, c 14 production, 1334
- carbon dioxide**, antimony, bicarbonate, buffer, carbon dioxide tension, hydrogen ion, microelectrode, oxygen tension, antimony microelectrode, 165
 - blood carbon dioxide, plasma, measurement, ericson e 101, 2551
 - blood rheology, gas diffusion, hemoglobin, mathematic model, oxygen, ph, 1307
 - carbon dioxide electrode, carbonic acid, plasma, serum, potentiometry, 1393
 - carbon monoxide, fluoride, gas diffusion, helium, lung diffusion, mathematic model, oxygen, binary diffusion coefficient, 2828
 - diving, dyspnea, exercise, functional residual capacity, helium, hyperbarism, lung volume, 49.5 ata, 6 divers, 1298
 - evaporation, oxygen consumption, respiration quotient, water loss, water loss measurement, bird, lizard, 206
 - extracorporeal circulation, extrapulmonary oxygenation, lung ventilation, oxygenator, sheep, 322
 - gas, gas chromatography, nitrogen, oxygen, scholander method, 1394
 - gas analysis, lung closing volume, lung function test, water, acoustic analyzer, 2218
 - model, respiration control, grodin model, 2827
 - venous blood, estimation, 565
- carbon dioxide electrode**, arterial carbon dioxide tension, arterial oxygen tension, mass spectrometry, oxygen tension electrode, venous oxygen tension, continuous measurement, 3632
 - carbon dioxide, carbonic acid, plasma, serum, potentiometry, 1393
 - microelectrode, monitoring, in vivo measurement, 3634
- carbon dioxide laser**, calorimetry, laser, power measurement, co₂ laser, 174
 - cystoscopy, instrument, experiment, rabbit, 3719
- carbon dioxide tension**, antimony, bicarbonate, buffer, carbon dioxide, hydrogen ion, microelectrode, oxygen tension, antimony microelectrode, 165
 - brain blood flow, mathematic model, oxygen tension, 470
 - transcutaneous carbon dioxide measurement, 751
- carbonic acid**, carbon dioxide, carbon dioxide electrode, plasma, serum, potentiometry, 1393
- carbon monoxide**, air pollution, hydrochloric acid, hydrofluoric acid, infrared radiation, nitrogen oxide, sulfur dioxide, 233
 - carbon dioxide, fluoride, gas diffusion, helium, lung diffusion, mathematic model, oxygen, binary diffusion coefficient, 2828
 - carboxyhemoglobin, fetus, mathematic model, mother, uptake and elimination, sleep, 464
 - helium, lung diffusion, sulfur hexafluoride, 3163
 - lung diffusion capacity, automatic device, dog, single breath, 164
- carboxyhemoglobin**, carbon monoxide, fetus, mathematic model, mother, uptake and elimination, sleep, 464
- carcinomatous meningitis**, cancer chemotherapy, cancer graft, cancer growth, walker carcinoma, rat model, histopathology, screening of antineoplastic agents, 398
- cardiography**, aorta subvalvular stenosis, computer, echography, mitral valve prolapse, mitral valve stenosis, pattern recognition, 3102
 - echocardiography, echography, mitral valve, mitral valve stenosis, 20 normals, 718
 - echocardiography, echography, image processing, ultrasonics, real time conversion, 1052
 - echography, electrocardiography, fetus heart rate, heart rate, monitoring, siemens partecust, 325
 - echography, kinetocardiography, ultrasonic transducer, 2284
 - heart output, impedance plethysmography, method, 3691
 - magnetocardiography, vectorcardiography, 1864
 - plethysmography, review, 2933
- cardiology**, data base, histopathology, information processing, pathology, respiration, ssis, 3087
 - electric accident, electronic instrument, medical engineering, 2591
- cardiotachometer**, blood pressure, electrocardiography, heart rate, 2917
 - digital analog converter, heart rate, period meter, 1847
 - heart rate, beat by beat meter, 1851
- cardiotocography**, electrode, fetus, fetus monitoring, scalp, stainless steel, fine stainless steel wire, 100 cases, 3395
 - fetus, pregnancy, multichannel monitor, 1549
- cardiovascular murmur**, artery murmur, artery occlusion, blood flow, mathematic model, phonocardiography, 1308
- cardiovascular system**, acceleration, headache, heart rate, mathematic model, stress, 2812
 - aorta balloon, aorta valve prosthesis, assisted circulation, korotkow sound, simulator, design, performance, 2177
 - averaging, data analysis, 3295
 - ballistocardiography, model, 216
 - mathematic model, simulator, simulation requirement, 2176
 - mathematic model, dynamic test method, 921

car driving, accident, automobile industry, cost benefit analysis, risk factor, safety, usa, 1529

- accident, eye movement, vision, curve negotiation, 1120
- fatigue, model, stress, real situation simulation, highway driving, 3370
- medical examination, physical disability, 3369
- physical disability, prescription, 274

beta carotene, cellulose derivative, lecithin, membrane potential, photostimulation, retinal isomer, 3156

carotico cavernous fistula, artificial embolism, balloon occlusion, catheter, embolization, 1453

carotid arteriography, arteriography, atherosclerosis, doppler ultrasound flow meter, ultrasonics, real time ultrasonic imaging system, 3676

- artificial embolism, balloon, brain vascularization, technical note, 3327

carotid artery, aorta, artery flow, blood flow, blood vessel, doppler ultrasound flow meter, femoral artery, transcatheter vs implanted cuff, 224

- arteriography, arteriotomy, brachial angiography, brachial artery, brain atherosclerosis, heart catheterization, neck, 258 cases, 3755
- clostridiopeptidase a, elasticity, hyaluronidase, iodoacetate sodium, model, noradrenalin, pancreatopeptidase e, sodium cyanide, maxwell model, voigt model, 1656

carotid artery obstruction, blood pressure, echography, eye pulse, ultrasonics, no touch measurements, 1473

- brain blood flow, brain blood volume, brain infarction, brain scintigraphy, brain tumor, technetium 99m, transient ischemic attack, xenon 133, 43 cases, 2206

carotid endarterectomy, brain atherosclerosis, doppler ultrasound flow meter, stroke, diagnosis, 2962

carrageen, inflammation, paw edema, salicylic acid, edema measurement method, rat, 3679

cartilage, articular cartilage, femur, shear stress, viscoelasticity, rabbit, 38

- bone, ear, high frequency cinematography, grinding instruments, 326
- cartilage cell, joint, impact characteristics, 1527
- interstitial fluid, viscoelasticity, non linear interaction, cattle, 39
- model, thorax, finite element analysis, 1671

cartilage cell, cartilage, joint, impact characteristics, 1527

case finding, medical record, multiphasic testing, outpatient department, multiphasic screening group, chart abstract group, chart review group, comparisons, 835

casein, body weight, mathematic model, nutrient, rat, 13

cassette recorder, electrocardiography, electroencephalography, physiology, plethysmography, sexual arousal, sexuality, vagina, vaginal photoplethysmography, cassette recorder, 1883

cast, articular, elasticity, heart left ventricle, heart muscle, mathematic model, urethan, calculation of young's elastic modulus, 433

cat, cobalt therapy, dosimetry, phantom, roentgen dose distribution, tissue inhomogeneities, 3432

- computer program, image processing, feature extraction, 3777
- roentgen radiation, 3781

catalse, escherichia coli, respiration, superoxide dismutase, ultraviolet radiation, continuous flow system, 1344

cataract, eye photography, slit lamp photography, tomographic measurements, method, 3343

cataract extraction, astigmatism, cornea curvature, cornea transplantation, keratometer, microsurgery, troutman type, 1517

catastrophe, age, population model, age group elimination, 5

catheter, abdominal aortography, aortography, catheter with multiple side holes, 736

- accident, burn, fire risk, nasogastric tube, oxygen breathing, case, 229
- angiocardiology, embolism, heart catheterization, thrombosis, pigtail catheter, different sideholes numbers, catheter comparison, 3754
- angiocardiology, brachial artery, heart catheterization, 700 cases, 3018
- aortofemoral bypass graft, celiac trunk angiography, dacron, percutaneous selective angiography, case report, 3382
- artery catheterization, lung artery, flush system, infusion system, drip chamber, 1066
- blood flow, flowmeter, velocity, cross section and flow, 2199
- blood pressure, pressure transducer, small animals, microtransducer, pressure step calibration, 2533
- blood sampling, double lumen catheter, 626
- blood sampling, cold, intravenous infusion, temperature control, catheter content control, sheep, 2938
- blood viscosity, manometry, serum colloid osmotic pressure, continuous measurement, 212
- breathing, esophagus pressure, catheter choosing, 3270
- cholangiography, cystic bile duct, peroperative cholangiography, cystic duct catheter clamp, 1035
- electric accident, electrode, heart catheterization, heart ventricle fibrillation, conductive catheter, 2594
- infrared radiation, oximetry, oxygen, photometry, 1395
- intravascular catheter, exteriorization device, dog, 223
- antitortatory device, free movement, animal, rat, 504

catheter flowmeter, artery, blood vessel diameter, electromagnetic flowmeter, 2599

- electromagnetic flowmeter, 1381

cauda equina, ankylosing spondylitis, computer assisted tomography, myelography, case report, man of 68,

- cause of death**, artificial heart, hemodynamics, long term effect, calf, 1853
- cava vein blood flow**, hemodynamics, inferior cava vein, vein blood flow, human, 924
- cavitation**, cell, ultrasonics, yeast, yeast cell, mechanism, 1021
- celiac trunk angiography**, aortofemoral bypass graft, catheter, dacron, percutaneous selective angiography, case report, 3382
- cell**, bone marrow cell, cross correlation, microscopy, multispectral cell image, 2307
- cavitation, ultrasonics, yeast, yeast cell, mechanism, 1021
 - cell interaction, cell potential, dielectric constant, model, 485
 - cell membrane potential, magnetic field, 486
 - cell membrane resistance, cylindrical cell, cable model, 163
 - cell population, mathematic model, mitosis, autooscillation delay, 391
 - cell size, microscopy, circumfusion chamber, micrometry, living single cells, 569
 - cytology, fourier transform, image processing, uterine cervix cytology, 2511
 - cytology, mathematic model, pattern recognition, uterine cervix cytology, 2509
 - cytometry, fluorescein derivative, device, 1346
 - drug, iontophoresis, membrane capacitance, time course, 483
 - drug dose, restraining device, skin, skin dosing cell, rat, guinea pig, 607
- cell adhesion**, cell contact inhibition, cell fusion, mathematic model, metastasis, van der waals force, 1263
- van der waals force, biophysics, 2468
- cell aggregation**, glanzmann disease, staphylococcus aureus, thrombocyte aggregation, willebrand disease, measurement device, 3283
- cell contact inhibition**, cell adhesion, cell fusion, mathematic model, metastasis, van der waals force, 1263
- cell count**, computer analysis, mast cell, image analysis, quantimet 720, 3408
- cell culture**, acetal, biocompatibility, cytotoxicity, nylon, plastic, polyethylene, polystyrene, polyurethan, silastic, teflon, testing, 866
- cyclotron, fast neutron radiation, fibroblast, hemopoietic cell, leukemia cell, gamma radiation, relative biologic effectiveness, radiologic calibration program, hamster, human fibroblast, mouse, guinea pig, 2094
 - magnesium acetate, glass roller bottle, 101
- cell cycle**, cancer chemotherapy, deoxyribonucleic acid, drug dose, drug resistance, system analysis, model, mouse, 783
- cell kinetics, population model, 25
- cell death**, ultrasonics, elodea leaf, 2165
- cell dedifferentiation**, bladder carcinoma, cancer cytodiagnosis, computer, urogenital tract, unsupervised learning algorithms, 1156
- bladder carcinoma, cancer cytodiagnosis, computer, urogenital tract, supervised learning algorithms, classification, 1155
- cell diameter**, erythrocyte, laser, light diffraction, microscopy, 2182
- cell division**, cell proliferation, mathematic model, population model, 2398
- growth, mathematic model, mitochondria, 1635
- cell fluid**, conductivity, micropipette, resistance, indirect measurement, 1809
- cell fusion**, cell adhesion, cell contact inhibition, mathematic model, metastasis, van der waals force, 1263
- cell growth**, cell motion, displacement, mathematic model, 1646
- cell population, circadian rhythm, glycolysis, metabolism, 2792
 - computer model, 3682
 - feedback system, mathematic model, 1650
- cell identification**, automation, monocyte, spectral characteristics, automation, 333
- cell interaction**, cell, cell potential, dielectric constant, model, 485
- cell kinetics**, artery graft, biocompatibility, blood, prosthesis, thrombocyte, thrombosis, 3
- cell cycle, population model, 25
 - cell proliferation, estrogen therapy, hormone, population model, mice, 2406
 - chemical kinetics, chemotracer, mathematic model, 2402
 - computer, radiation dose fractionation, radiation survival, radiotherapy, simulation of radiobiological data, 845
- cell membrane**, adenosine triphosphate, calcium, cell membrane permeability, model, sodium, transport mechanism, 2011
- adenosine triphosphate, calcium pump, sarcoplasmic reticulum, 405
 - benzimidazole derivative, mathematic model, mitochondria, oxidative phosphorylation, in vitro, model study, 2764
 - blood disease, erythrocyte membrane, erythrocyte osmotic fragility, statistics, osmotic fragility curve, 2180
 - caffeine, calcium, egg, methyladenine, oogenesis, theobromine, theophylline, hormone surface interaction, scanning electron microscopy, starfish, 3716
 - calcium adenosine triphosphatase, lipid membrane, membrane protein, rhodopsin, 404

- cancer cell, protein bound iodine 125, binding, device, novikoff tumor cells, 947
- cell membrane impedance, ion transport, mathematic model, nerve cell, 2079
- cell membrane permeability, diffusion, fluidics, mathematic model, 2431
- cell membrane potential, ion exchange, ultraviolet radiation, spiropyran, photovoltaic cell, photochromism, 1007
- cell membrane potential, donnan potential, 2075
- cell membrane potential, electric field, mathematic model, ionic solution, 3176
- cell membrane potential, mathematic model, noise generator, 2843
- cell membrane potential, noise generator, 2842
- cell membrane transport, chemical kinetics, mathematic model, 2171
- cell shape, image processing, protein, roentgen radiation, electron microscopy, 3221
- constant current stimulator, electrostimulator, membrane potential, nervous system, current rectification, resistance measurement, 1491
- diffusion, diffusion coefficient measurement, 1249
- displacement transducer, transducer, 509
- diving, heart rate, hydrostatic pressure, nerve cell, pacemaker, mouse, rat, guinea pig, rabbit, dog, 3692
- electromagnetic radiation, microwave radiation, thermodynamics, non thermal effects, 1833
- endothelium cell, mathematic model, pinocytosis, vesicular transport, 18
- ion exchange, mathematic model, sodium channel, 2848
- ion transport, mathematic model, membrane, osmotic pressure, thermodynamics, 2437
- ion transport, mathematic model, membrane, osmotic pressure, thermodynamics, 2436
- ion transport, retina cone, ionic channel closure, turtle, 1521
- microelectrode, resistance, tip geometry, 1808
- cell membrane capacitance**, cell membrane resistance, cell potential, equivalent circuit, acetabularia, 488
- cell membrane conductance**, gating circuit, nerve fiber membrane, potassium channel, sodium channel, transient polarization current, squid, 2070
- mathematic model, membrane, noise, 2409
- membrane potential, phospholipid membrane, sarcoplasmic reticulum, 3501
- cell membrane impedance**, cell membrane, ion transport, mathematic model, nerve cell, 2079
- cell membrane permeability**, adenosine triphosphate, calcium, cell membrane, model, sodium, transport mechanism, 2011
- cell membrane, diffusion, fluidics, mathematic model, 2431
- chloride, nerve fiber membrane, nerve fiber membrane permeability, nerve fiber membrane steady potential, ph, potassium, sodium, crayfish, 1718
- compartment model, electrolyte, epithelial cell, mathematic model, weak electrolyte, 20
- embryo, heart atrium, heart muscle, heart muscle contraction, electrical stimulus changes, chicken, 2411
- epithelial cell, hydrostatic pressure, kidney tubule, osmotic pressure, 387
- epithelial cell, mathematic model, thermodynamics, tracer flux ratio, 896
- erythrocyte membrane, naphthalene sulfonate derivative, thermodynamics, 3152
- hodgkin huxley equation, mathematic model, nerve cell membrane, complex admittance, squid, 2841
- cell membrane potential**, cell, magnetic field, 486
- cell membrane, ion exchange, ultraviolet radiation, spiropyran, photovoltaic cell, photochromism, 1007
- cell membrane, donnan potential, 2075
- cell membrane, electric field, mathematic model, ionic solution, 3176
- cell membrane, mathematic model, noise generator, 2843
- cell membrane, noise generator, 2842
- differential amplifier, epithelium, signal noise ratio, 2886
- fluorescence, nerve cell membrane potential, thermodynamics, 2838
- glass electrode, kidney slice, microelectrode, sweat gland, self filling, semifloating, rat, 1805
- heart muscle, light reflection, pulse generator, stimulator, capacitor discharge, frog, 78
- ion transport, mathematic model, thermodynamics, 1676
- cell membrane receptor**, mathematic model, muscle contraction, kinetic model, 2814
- cell membrane resistance**, cell, cylindrical cell, cable model, 163
- cell membrane capacitance, cell potential, equivalent circuit, acetabularia, 488
- cell membrane transport**, cell membrane, chemical kinetics, mathematic model, 2171
- cell metabolism**, cancerogenesis, chemical kinetics, mathematic model, 2014
- cell motion**, cell growth, displacement, mathematic model, 1646
- computer model, embryo motility, engulfment, 3317
- mathematic model, pattern recognition, markov model, 884
- cell necrosis**, SEE necrosis
- cell nucleus**, cell shape, lymphocyte, automated cell classification, cell clusters, subclusters, lymphoreticular tissue, 2299
- computer analysis, endometrium carcinoma, endometrium hyperplasia, pattern recognition, quantitative microscopy, 2956

- cellophane**, artificial kidney, cellulose membrane, cuprophane, hemodialysis, hemodialysis membrane, ion exchange, 1875
- cell population**, cell, mathematic model, mitosis, autooscillation delay, 391
 - cell growth, circadian rhythm, glycolysis, metabolism, 2792
 - mathematic model, mitosis, self oscillation, density control, 2008
 - population model, lotka volterra model, 1634
- cell potential**, cell, cell interaction, dielectric constant, model, 485
 - cell membrane capacitance, cell membrane resistance, equivalent circuit, acetabularia, 488
- cell proliferation**, cell division, mathematic model, population model, 2398
 - cell kinetics, estrogen therapy, hormone, population model, mice, 2406
- cell shape**, cell membrane, image processing, protein, roentgen radiation, electron microscopy, 3221
 - cell nucleus, lymphocyte, automated cell classification, cell clusters, subclusters, lymphoreticular tissue, 229
 - computer analysis, pattern recognition, software system, pdp12 computer, 3407
 - computer analysis, image display, pattern recognition, microscopic image, interactive measurements, program system, 2298
- cell size**, cell, microscopy, circumfusion chamber, micrometry, living single cells, 569
- cell structure**, anatomy, embryogenesis, gastrulation, mathematic model, tissue, 3510
 - centrifuge, erythrocyte, erythrocyte deformation, microscopy, human, 3278
- cell survival**, fast neutron radiation, negative pion radiation, roentgen radiation, 3203
- cell transport**, membrane, permeation time, diffusion equation, 1256
- cellular immunity**, corona virus, immune deficiency, mononuclear granulocyte, mouse hepatitis virus, spleen cell transplantation, thymectomy, T lymphocyte, virus infection, 3402
 - dose response, mathematic model, migration inhibition, migration assay, 19
- cellulose derivative**, beta carotene, lecithin, membrane potential, photostimulation, retinal isomer, 3156
- cellulose membrane**, artificial kidney, cellophane, cuprophane, hemodialysis, hemodialysis membrane, ion exchange, 1875
- cell volume**, elasticity, erythrocyte membrane, viscosity, human, 215
- central nervous system**, attenuated virus, live vaccine, lumbar spine, mathematic model, neurovirulence, poliomyelitis virus, thalamus, virus, virus virulence, neurovirulence assay, monkey, 3492
 - cobalt therapy, linear accelerator, radiation field, orthogonal field, dose distribution, 3025
 - magnetic field, biological effects, controlled thermonuclear reactor, 2893
- central nervous system metastasis**, astrocytoma, brain tumor, computer assisted tomography, craniopharyngioma, hypophysis adenoma, meningioma, 1658 cases, 817
 - brain artery aneurysm, brain hemorrhage, brain tumor, chromophobe adenoma, computer assisted tomography, coronal and sagittal reconstruction, 3452
 - brain atrophy, computer assisted tomography, electroencephalography, encephalitis, epilepsy, partial epilepsy, tonic clonic epilepsy, 99 cases, 829
- central venous pressure**, blood pressure, computer, electrocardiography, electroencephalography, monitoring, 781
 - noninvasive measuring method, 3700
- centrifuge**, arteriole, blood pressure, capillary flow, gravitation, noradrenalin, 2 g centrifugation, second generation rats, carotid artery, mesentery arteriole, 716
 - behavior, gravity, sitting, non linear properties, upright sitting human body, driving point impedance, 2652
 - bone stress, femur, gravitational stress, weightlessness, 3g mouse, 2647
 - cell structure, erythrocyte, erythrocyte deformation, microscopy, human, 3278
- ceramics**, aluminum oxide, polyethylene, total hip prosthesis, tribologic aspects, 1622
 - bone, biodegradation, 384
 - bone piezoelectric potential, cortical bone, dielectric constant, silicon dioxide, titan acid, ultrasonics, human, 75
 - hip prosthesis, metal, total hip prosthesis, 30 patients, 278
 - total hip prosthesis, ceramic endoprosthesis fatigue strength, 283
- cerebellomedullary cistern**, endoscopy, pons angle, pterygoid fossa, apparatus description, 3273
- cerebellum**, brain depth recording, microelectrode, stereotaxic implantation, awake, cat, 1075
 - brain hypothermia, motor cortex, cooling probe, coding device, 3524
 - brain white matter, computer assisted tomography, posterior fossa, cerebellum white matter, 3821
 - computer assisted tomography, hemangioblastoma, spinal cord, von hippel lindau disease, case report, 3073
 - computer model, mathematic model, nerve cell network, purkinje cell, frog, 487
- cerebellum atrophy**, age, computer assisted tomography, lennox gastaut syndrome, 38 cases, etiology, 2735
- cerebellum cortex**, compartment model, computer model, muscle fiber, nerve cell network, 1729
 - computer model, mathematic model, nerve cell network, purkinje cell, frog, 1717
 - golgi cell, mathematic model, nerve cell network, golgi cell function, 3558
 - mathematic model, mossy fiber, temporal behavior, turtle, 2087
 - memory, music, nerve cell network, pattern recognition, purkinje cell, d neuronal network, 1732

cerebellum hemorrhage, brain hematoma, brain stem compression, computer assisted tomography, hypertension, neurosurgery, 10 cases, 3827

- cerebellum infarction, cerebrovascular accident, computer assisted tomography, vertebral artery angiography, review, 1191

cerebellum infarction, cerebellum hemorrhage, cerebrovascular accident, computer assisted tomography, vertebral artery angiography, review, 1191

cerebellum tentorium, arteriovenous malformation, computer assisted tomography, subarachnoid hemorrhage, vein sinus, vein thrombosis, normal ct appearance, nonneoplastic pathology, 1596

cerebellum tumor, brain angiography, brain tumor, computer assisted tomography, ependymoma, hemangioblastoma, medulloblastoma, 22 children, 3455

cerebellum vermis, computer assisted tomography, meglumine diatrizoate, pseudotumor, diagnostic pitfall, 5 cases, 1967

cerebral palsy, body posture, chair, electromyography, ergonomics, sitting, method, 284

- electromyography, gait, hemiparesis, muscular dystrophy, telemetry, temporal information, 100 cases, 1904
- electrostimulation, hemiplegia, movement, orthosis, paralysis, actual situation, problem, 713

cerebrospinal fluid, ascorbic acid, brain, computer, extracellular space, mannitol, pharmacokinetics, model, rabbit, 859

- blood, computer assisted tomography, quantitative aspects, fresh and coagulated blood, 832
- brain arachnoid cyst, brain cyst, cisternography, computer assisted tomography, metrizamide, 4 cases, 3441
- brain blood flow, hypertension, 91 newborn infants, aplanation measurement, 2227
- brain cyst, brain tumor, computer assisted tomography, absorption coefficient, 11 cases, differential diagnosis, 2340
- brain depth stimulation, electrolysis, platinum electrode, non gassing limit, 2090
- brain edema, electroencephalography, head trauma, hematoma, intracranial hypertension, tumor, cat, epidural pressure measurement, 1076
- brain edema, brain ventricle, computer assisted tomography, ependyma, hydrocephalus, 4 patients, transependymal csf absorption, 2736
- brain tumor, electrocardiography, electroencephalography, hematoma, intracranial hypertension, pneumoencephalography, telemetry, 20 cases, continuous recording, technique, 1487
- computer assisted tomography, hydrocephalus, normotensive hydrocephalus, penthanil yb 169, scintiscisternography, subarachnoid hemorrhage, 54 cases, 2721
- intracranial hypertension, apparatus, measurement, durometer, 679

cerebrospinal fluid flow, cisternography, computer assisted tomography, metrizamide, 25 cases, 812

cerebrospinal fluid pressure, blood vessel, brain, brain depth injection, cannula, 677

- hemodialysis, kidney failure, mathematic model, urea, treatment guideline, 477
- telemetry, improved measurement instrument, 2109
- continuous recording method, 12 cases, 2625

cerebrospinal fluid shunting, brain ventricle, computer assisted tomography, hydrocephalus, porencephaly, 4 cases, motor deficit, 1575

cerebrovascular accident, aged, brain hematoma, brain infarction, brain tumor, computer assisted tomography, stroke, subdural hematoma, diagnostic value, 3830

- brain angiography, brain scintigraphy, computer assisted tomography, stroke, review, 1587
- cerebellum hemorrhage, cerebellum infarction, computer assisted tomography, vertebral artery angiography, review, 1191
- electrocardiography, prognosis, automated analysis, 6 serial eeg, 26 volunteers, 1949

cerebrovascular disease, brain angiography, brain artery aneurysm, brain vasospasm, computer, stethoscope, electronic stethoscope, 6 illustrative cases, 2162

- brain blood flow, computer, computer program, xenon 133, multiexponential curve fitting, 3482
- brain contusion, computer assisted tomography, glioblastoma, hydrocephalus, meningioma, 1215
- brain death, cancer, echoencephalography, echography, echotomography, ultrasonics, survey, 1826

erenkov radiation, scintillation counting, automatic control system, 3249

cervical spine, biomechanics, trauma, 1275

- computer assisted tomography, head, skull base, coronal head scan, 1214

cervical spine traction, myelography, tomography, traction device, 2274

esarean section, isolation unit, 3315

esium 137, cobalt 58, cobalt 60, multichannel analyzer, pulse height analysis, gamma radiation, 10 x 10 channel, 189

- diffusion, epidermis, skin permeability, strontium 89, role, 292

hair, body posture, cerebral palsy, electromyography, ergonomics, sitting, method, 284

haracter recognition, pattern recognition, reading aid, hand printing, 3739

- pattern recognition, reading aid, hand printing, 3738
- pattern recognition, reading aid, handwriting, 3737

heckerboard, evoked visual response, television, pattern generator device, 242

cheek, forceps, new instrument, bivalded cheek forceps, 2679

chelating agent, agriculture, food chain, penthanil, plant, plutonium 239, radioactive contamination, pu 239 uptake, usa, 95

chemical kinetics, adrenal gland, corticotropin, model, 2183

- antigen protein, enzyme, ribonuclease, ribonucleic acid, ultrasonics, ultrasonic cavitation, 203
- calorimetry, micro calorimeter, differential calorimeter, 149
- cancerogenesis, cell metabolism, mathematic model, 2014
- cell kinetics, chemotracer, mathematic model, 2402
- cell membrane, cell membrane transport, mathematic model, 2171
- compartment model, mathematic model, 2015
- computer model, molecular structure, nutrition, chemoton, 610
- computer model, diffusion, pattern recognition, activator inhibitor, 2397
- computer model, enzyme, multiple pathway reaction, 1254
- computer model, coupled reaction, 23
- computer model, evolution, life, mathematic model, prokaryotic cell, 2774
- enzyme kinetics, mathematic model, 413
- flash lamp, photolysis, 2561
- linear system, mathematic model, 1640
- model, poikilothermy, thermodynamics, 208
- nonlinear system, signal noise ratio, 414
- photolysis, resistance, ionization reaction, 558

chemoreceptor, chemotaxis, escherichia coli, pheromone, physics, 2009

chemotaxis, chemoreceptor, escherichia coli, pheromone, physics, 2009

- mathematic model, phagocytosis, polymorphonuclear granulocyte, markov model, 396

chemotherapy, antenna, brain depth stimulation, microwave radiation, radiation hazard, stereotaxis, 2172

chemotracer, cell kinetics, chemical kinetics, mathematic model, 2402

- fluorescence, roentgen radiation, compton scattering, 586

cheyne stokes breathing, biofeedback, chronic granulocytic leukemia, hematopoietic disease, mathematic model, nonlinear system, process control, respiration, 1299

chickenpox, acantholysis, herpes zoster, immunosuppression, staining, vesiculo bullous disorders, paragon multiple stain, 500

child anesthesia, anesthetic equipment, automotive exhaust, scavenger, waste gases see exhaust gases, 1136

- anesthetic equipment, new system, 1933
- automotive exhaust, scavenging system, 1135

chloride, bladder, freeze drying, potassium, roentgen analysis, skin, sodium, soft tissue, frog, toad, 2860

- cell membrane permeability, nerve fiber membrane, nerve fiber membrane permeability, nerve fiber membrane steady potential, ph, potassium, sodium, crayfish, 1718

chloride electrode, calcium electrode, ion exchange, magnesium electrode, microelectrode, potassium electrode, physicochemistry, 1343

chlorine, copper 65, nuclear magnetic resonance, element analysis, 2859

chlorophyll, cytochrome, electron transport, infrared radiation, spectrometry, electron tunneling, 180

- laser, methylpheophorbide a, photosynthesis, pheophetin a, 167

chloroplast, computer model, photosynthesis, translocator, kinetic model, 402

chlorpromazine, synaptosome membrane, tetracaine, structural rearrangements, rat, guinea pig, 390

cholangiography, bile duct, biliary tract endoscopy, fujinon, 617

- catheter, cystic bile duct, peroperative cholangiography, cystic duct catheter clamp, 1035

cholelithiasis, common bile duct, endoscopy, gallstone, lithotripsy, 1036

cholesterol, atherosclerosis, computer, densitometry, femoral angiography, cadaver angiograms, 1599

cholic acid, acetylcholine, cholinergic receptor, model, triton x 100, model evaluation, theatrical aspects, 12

cholinergic receptor, acetylcholine, cholic acid, model, triton x 100, model evaluation, theatrical aspects, 12

cholinergic system, acetylcholine, computer model, dopamine, dopamine system, extrapyramidal system, haloperidol, theoretical aspects, 3328

- membrane permeability, potassium channel, no constant field, 935

cholinesterase, automation, enzyme inhibition, information processing, stop flow technique, inhibition constant, 1151

chopper, neutron radiation, pulse generator, propagation speed, 3674

chopper amplifier, direct current amplifier, superconduction, 953

chorda tendinea, elasticity, mitral valve, dynamic elasticity, human tendineae, 1663

chordoma, acoustic nerve neurinoma, computer assisted tomography, hypophysis adenoma, skull base, 801

chorionic gonadotropin, computer assisted tomography, alpha fetoprotein, retroperitoneal cancer, testis cancer, 4 cases, 3822

choroid tumor, computer assisted tomography, hemangioma, 3 cases, diagnosis, 765

chromatography, aminoacid, electrophoresis, skin, thin layer chromatography, urea, method, device, 3746

- liquid chromatography, new detectors, 1796

chromium 51 labelled lymphocyte, adhesion, lymphocyte, mathematic model, T lymphocyte, rat, lymphocyte adhesion, 8

chromophobe adenoma, brain artery aneurysm, brain hemorrhage, brain tumor, central nervous system metastasis, computer assisted tomography, coronal and sagittal reconstruction, 3452

chromosome, radiation hazard, pattern classification, 1540

chromosome analysis, automation, computer analysis, histogram, mitosis, automated classification, 2300

- computer, karyotype, lymphocyte, metaphase, microscopy, automatic metaphase finding, 1563
- computer analysis, karyotyping, pattern recognition, computer assisted analysis, 2302
- computer analysis, sister chromatid exchange, exchange frequency, automatic measurement, 2301

chronic disease, breast cancer, mammography, mass screening, model, periodic medical examination, mathematical analysis, transient analysis, screening interval, 1250

- heart disease, ischemic heart disease, mathematic model, 1703

chronic granulocytic leukemia, biofeedback, cheyne stokes breathing, hematopoietic disease, mathematic model, nonlinear system, process control, respiration, 1299

chronic pancreatitis, acute pancreatitis, computer assisted tomography, pancreas cancer, 121 cases, 820

ciliary motility, airway, mathematic model, human airway lengths, 3109

- bronchus, computer, trachea, dogs, new measuring technique, 1237
- cilium, mathematic model, porous medium model, 50

cilium, ciliary motility, mathematic model, porous medium model, 50

- flagella, mathematic model, twisted filament, displacement, sliding, 37

cineangiocardiology, computer, heart left ventricle ejection fraction, heart ventricle enddiastolic volume, special purpose calculator, 3477

cineangiography, heart catheterization, heart left ventricle, heart left ventricle volume, swan ganz catheter, calibration method, 1464

cinematography, electromyography, gait, telemetry, analysis method, daily orthopedic practice, 843

- electromyography, synchronization, 946

cineradiography, image intensifier, moving object, 3379

circadian rhythm, automation, hematocrit, hemoglobin, leukocyte count, thrombocyte count, differential count, hemalog d, 3685

- biofeedback, heart, mathematic model, sweating, 2791
- body temperature, computer, confinement, heart rate, walking, sheep, 847
- cell growth, cell population, glycolysis, metabolism, 2792
- computer model, ethanol, fluid intake, mouse, 400
- computer program, periodicities, time series, 848
- digital computer, fourier transform, information processing, progressive analysis, 2391
- drinking, photoelectric cell, recording system, rodent, primates, 1503
- generator, zeitgeber, 2 coupled oscillator, 2967
- mathematic model, 1645
- mathematics, nerve cell network, swimming, differential equation, fish, 3553

circuit design, active filter, semiconductor, CMOS active-R filter, 2101

circular dichroism, adenosine triphosphatase, heart failure, heart muscle, myosin, electron microscopy, dog, 632

circular tomography, linear tomography, tomography, comparison of diagnostic value, 2277

circulation, aorta flow, capillary flow, model, vein blood flow, 919

- blood flow, heart left ventricle, hemodynamics, mathematic model, parameter extraction, 469

circulation model, mathematic model, monitoring, systolic blood pressure, elastic reservoir, 1701

cisternography, acoustic nerve neurinoma, computer assisted tomography, metrizamide, neurinoma, pons angle tumor, 10 cases, 3841

- brain arachnoid cyst, brain cyst, cerebrospinal fluid, computer assisted tomography, metrizamide, 4 cases, 3441
- brain tumor, computer assisted tomography, metrizamide, suprasellar mass, 10 cases, 1589
- cerebrospinal fluid flow, computer assisted tomography, metrizamide, 25 cases, 812

clamp, heart ventricle enddiastolic volume, heart ventricle endsystolic volume, heart ventricle pressure, heart ventricle volume, isolated heart, pump, servocircuit, volume clasper, dog, 3290

classification, breast cancer, computer assisted diagnosis, medical record, treatment selection, 26 cases, 761

- coding, diagnosis, index, medical record, pathology, german, 341

clearance, heart output, indicator dilution curve, mathematic model, unified estimation theory, 73

- hippuric acid i 125, scintillation camera, method, 1874

climate, energy consumption, environment, 2577

clinical chemistry, computer, information processing, one line problems, 2691

- computer, quality control, laboratory automation, 1562
- computer, laboratory test, medical audit, continuing education, control of overutilization, 3794
- decision theory, multi flipflop, 2020
- digital computer, enzyme kinetics, photometry, spectrometry, zeiss prp, 753

- sound absorption, spectrometry, 1829
- clinical laboratory**, computer, cost, hospital, 3405
 - information processing, microcomputer, distributed processing, 2304
- clinical study**, information processing, medical record, pharmacotherapy, 2750
- closed angle glaucoma**, age, computer, glaucoma, open angle glaucoma, prevalence, 1231
- clostridiopeptidase a**, carotid artery, elasticity, hyaluronidase, iodoacetate sodium, model, noradrenalin, pancreatopeptidase e, sodium cyanide, maxwell model, voigt model, 1656
- clothing**, blood stain, forensic medicine, isoenzyme, lactate dehydrogenase, soil, weapon, species origin, 3276
- coaxial cable**, antenna, telemetry, tunnel, 3220
- cobalt 58**, cesium 137, cobalt 60, multichannel analyzer, pulse height analysis, gamma radiation, 10 x 10 channel, 189
- cobalt 60**, beam profile, contour, gamma radiation, radiotherapy, central axis, 2273
 - cesium 137, cobalt 58, multichannel analyzer, pulse height analysis, gamma radiation, 10 x 10 channel, 11
 - dosimetry, fast electron radiation, lithium fluoride dosimeter, gamma radiation, radiotherapy, thermoluminescence, 1129
 - dosimetry, ionization chamber, phantom, gamma radiation, radiotherapy, 3013
 - megavoltage radiotherapy, radiation depth dose, radiation scattering, corrections, 1418
- cobalt therapy**, beam profile, dosimetry, skin, skin test, 3373
 - beam profile, cancer, dosimetry, phantom, 3433
 - cat, dosimetry, phantom, roentgen dose distribution, tissue inhomogeneities, 3432
 - central nervous system, linear accelerator, radiation field, orthogonal field, dose distribution, 3025
 - collimator, design principle, 2272
 - computer, dose calculation, megavoltage radiotherapy, central axis dose, 2741
 - computer assisted tomography, radiation isodose distribution, therapy, phantom, 3075
 - computer model, mathematic model, radiotherapy, 1965
 - dosimetry, medulloblastoma, treatment technique, 3376
 - megavoltage radiotherapy, radiation depth dose, radiation scattering, dose correction, 3668
- cochlea**, acoustic nerve, electrode, electrostimulation, scala tympani, nerve survival, stimulation pattern, cat, 3339
 - basilar membrane, hair cell, model, tuning model comparison, 2822
 - basilar membrane, cochlea fluid, mathematic model, 2 dimensional model, 59
 - basilar membrane, mathematic model, linear and nonlinear model, 1666
 - coding, correlation function, hearing, mathematic model, signal processing, reverse correlation technique, 3154
 - deafness, electrode, hearing aid, implantation, prosthesis, multiple electrode system, 3341
 - hearing, mathematic model, 2823
 - perception deafness, 13 patients, implants, 3728
- cochlea fluid**, basilar membrane, cochlea, mathematic model, 2 dimensional model, 59
- cochlea microphonic potential**, auditory stimulation, auditory system, electrode, sound, electrophonic effect, 689
 - brain depth stimulation, olivocochlear tract, summing, guinea pig, 2617
 - electrode, external ear canal, ear canal electrode plug, children, 1104
 - frequency discrimination, mathematic model, neural tuning curve, 2439
 - hearing, mathematic model, 2442
- cochlea model**, basilar membrane, transients, 36
- cochleography**, acoustic nerve neurinoma, meniere disease, differential diagnosis, 439 cases, 3337
 - audiometry, auditory masking, evoked acoustic nerve response, meniere disease, sudden deafness, tuning curve, 2443
 - evoked response audiometry, mathematic model, method, frequency specific information, 3528
- coding**, algorithm, computer, thyroid function test, 2305
 - automation, medical record, automatic coding, natural language text processing, 1226
 - classification, diagnosis, index, medical record, pathology, german, 341
 - cochlea, correlation function, hearing, mathematic model, signal processing, reverse correlation technique, 3154
 - computer, computer assisted diagnosis, diagnosis, automatic diagnosis coding, 2313
 - data reduction, image processing, 15
- cognition**, hemisphere, imagination, nerve cell, nerve cell network, perception, visual cortex, visual nerve cell, model, 86
- coil**, implant, power supply, telemetry, coil design, 2108
 - magnetic field, nuclear magnetic field, coil encapsulation, teflon, 1414
- colchicine**, adenosine triphosphate, cytoplasm, protoplasm streaming, nitella flexilis, 1626
- cold**, blood sampling, catheter, intravenous infusion, temperature control, catheter content control, sheep, 2938
- collagen**, age, aorta strip, aorta wall, elasticity, thoracic aorta, human, 59-82 yr, 44
 - artery, corrugated fibril mechanics, 637

- bone, bone piezoelectric potential, femur, collagen crosslink, binding sequence, rat, 2066
- bone piezoelectric potential, mathematic model, piezoelectricity, stress generated potential, 79
- calcified tissue, calcium phosphate hydroxide, elasticity, 1670
- cortical bone, mathematic model, osteon, piezoelectricity, stress frequency, 80
- sustained release preparation, young modulus, 1665
- college**, accident prevention, education, safety, university, curriculum, safety professional, model, 1830
- collimator**, cobalt therapy, design principle, 2272
 - computer assisted tomography, collimator performance, emi scanner, 3801
 - display system, fast electron therapy, linear accelerator, megavoltage radiotherapy, collimator positioning device, 2659
 - environment, solar cell, solar energy, spectrometry, 2558
 - fast neutron radiation, neutron radiation, radiation scattering, 596
 - fast neutron radiation, radiation scattering, 3257
 - mirror, solar energy, 3244
 - phantom, scintillation camera, dynamic studies, 305
 - gamma radiation, tomography, coincidence scanning, 1915
 - scintillation camera, scintiscanning, hybrid scanner, 2271
 - visual system, light concentrator, 575
- colloid**, deoxyribonucleic acid, electric field, fluorescence, macromolecule, induced fluorescence, 1831
- colloid cyst**, atomic number, brain cyst, computer assisted tomography, electron density, method, 12 cases, 2333
- colon disease**, endoscopy, sigmoidoscopy, 139 patients, diagnosis, flexible versus rigid sigmoidoscope, 1033
- colon tenia**, electricity, hodgkin huxley equation, mathematic model, smooth muscle, smooth muscle tone, guinea pig, 2037
- color**, vectorcardiography, color vectorcardiogram, direct writing, 2191
- colorimetry**, transducer, 572
- color perimetry**, perimetry, visual field, high luminance, 1896
- color vision**, brightness, mathematic model, visual system, brightness generation, 1693
 - dyslexia, visual stimulation, fading phenomena, 3732
 - holography, image processing, color holography, 3588
 - mathematic model, visual system, opposite color difference, anticolor, 3160
 - space, visual system, human, 266
 - vision, visual acuity, 2826
 - vision, chromatic discrimination, a chromatic discrimination, 1889
 - visual system, opposite colour, human, 3538
 - visual system, anticolor, human, 1899
- colostomy**, ileostomy, magnet, erlangen magnetic closure system, 113 cases, 1835
- coma**, brain hematoma, brain stem contusion, computer assisted tomography, head trauma, hygroma, 1000 consecutive patients, 1582
- common bile duct**, biliary tract, endoscopy, choledochofiberscope, 200 patients, diagnosis, 3275
 - cholelithiasis, endoscopy, gallstone, lithotripsy, 1036
- communication**, behavior, cosmonaut, medical assessment, space flight, space time dialogue, 295
 - disabled, prosthesis, transducer, morse decoding system, 1117
 - electric field, termites, 670
 - fourier transform, spectrum structure, dolphin, 3531
 - information science, medical journal, medical research, misinterpretation by lay press, newsworthiness, 863
 - physical disability, electronic device, 2639
- community**, annoyance, environmental sanitation, loudness, noise, perception, pollution, loudness scaling, 256
- commutator**, brain depth recording, brain depth stimulation, electrocardiography, lightweight, multi contact, 2966
- compact bone**, biomechanics, bone, hip bone, pelvis, bone stress evaluation, 3148
 - fatigue, stiffness, stress fracture, scanning electron microscopy, cattle, 1903
- comparator**, glaucoma, optic disk, stereophotography, new device, 3733
- compartment model**, adsorbent agent, artificial organ, perfusion, fixed bed adsorber, 2059
 - blood, bone, fourier transform, tissue, markov model, 2778
 - body temperature, breathing work, lung ventilation perfusion ratio, panting, respiration control, thermoregulation, dog, 1699
 - brain blood flow, computer, information processing, xenon 133, one line, 852
 - brain blood flow, hydrogen, measurement, 1055
 - cell membrane permeability, electrolyte, epithelial cell, mathematic model, weak electrolyte, 20
 - cerebellum cortex, computer model, muscle fiber, nerve cell network, 1729
 - chemical kinetics, mathematic model, 2015
 - computer, parameter space, 424
 - computer model, computer program, structural identification, 415

- computer model, parameter extraction, 2786.
- creatinine blood level, hemodialysis, mathematic model, peritoneal dialysis, urea blood level, uremia, 316
- curve fitting, information processing, numerical method, 2762
- erythrocyte sedimentation rate, characteristic, 627
- gas exchange, lung blood flow, lung diffusion, lung model, lung ventilation, lung ventilation perfusion ratio, inequalities, theoretical analysis, 462
- mathematic model, stochastic model, 2392
- mathematic model, realizability, delays, 3502
- model, pharmacokinetics, linear compartment model, micro constant, 410
- model, pharmacokinetics, linear compartment model, 409
- model, pharmacokinetics, linear compartment model, 408
- population model, stability, competitive model, 1649
- comment, 2026
- structural identifiability, 4

compound eye, rhabdome, misalignment, flies, 1292

compton effect, densitometry, photon scanning, tissue densitometry, 3383

computer, abdominal pain, acute abdomen, computer assisted diagnosis, 1537 patients, diagnosis, 1161

- acid base balance, blood gas, information processing, 3412
- acute lymphoblastic leukemia, B lymphocyte, data base, T lymphocyte, clinfo, 2365
- administration, information processing, medical record, nuclear medicine, france, nancy, 2749
- adverse drug reaction, medical literature, bibliometry, bibliometric analysis, 2371
- adverse drug reaction, drug monitoring, lyons civil hospital, 1572
- adverse drug reaction, information processing, monitoring, 3059
- age, closed angle glaucoma, glaucoma, open angle glaucoma, prevalence, 1231
- airway resistance, body plethysmography, total lung volume, manual vs automated method, 231
- alarm monitoring, heart arrhythmia, computerized arrhythmia alarm system, 780
- alarm monitoring, electrocardiography, heart infarction, heart ventricle arrhythmia, 2 computer programs comparison, 1568
- alarm monitoring, heart arrhythmia, 3428
- alertness, electroencephalography, electromyography, 5 hydroxytryptophan, levodopa, rem sleep, sleep spindle, stage 3 sleep, automatic classification, cat, 1620
- alertness, electroencephalography, electromyography, rem sleep, sleep, telemetry, rat, automatic analysis, 2111
- algorithm, electrocardiography, mathematic model, qrs complex, vectorcardiography, wave recognition algorithm, chest, 3180
- algorithm, breathing mechanics, calculator, programmable calculator, 2378
- algorithm, coding, thyroid function test, 2305
- alpha rhythm, beta rhythm, electroencephalography, mu rhythm, analysis, 500 eeg's, 1570
- alpha rhythm, electroencephalography, multichannel recorder, rem sleep, sleep, 10 subjects, automation, 2706
- alpha rhythm, beta rhythm, delta rhythm, electroencephalography, theta rhythm, 306 subjects, normal value, computer analysis, 2705
- amblyopia, eye movement, strabismus, binocular vision, motility testing, 3485
- ambulatory care, medical record, nurse, 837
- ambulatory care, cost benefit analysis, information processing, medical record, combined with manual techniques, indianapolis, 1609
- ammonium, aspartate aminotransferase blood level, brain edema, electroencephalography, encephalopathy, exchange blood transfusion, fatty liver, furosemide, mannitol, reye syndrome, 7 children, 779
- anesthesia, electroencephalography, frequency analyzer, hypoxia, microprocessor, minicomputer, monitoring, display system, cerebral function analyzer monitor, 3805
- anesthesia, repetitive task processing, 378
- anesthesia, medical record, vs man made record, 758
- anesthetic agent, blood chemistry, blood pressure, electroencephalography, monitoring, open heart surgery, temperature, patient monitoring system, 350
- angiocardiology, angiography, information processing, 3463
- angiography, image processing, x ray film, system, 3840
- anthropometry, program, health carter somatotype calculation, 3094
- antibiotic sensitivity, drug sensitivity, information processing, 331
- antihypertensive agent, hypertension, physician, prospective controlled study, 116 patients, 849
- aorta balloon, artery counter pulsation, assisted circulation, electrocardiography, trigger, optimum performance determination, 3098
- aorta stenosis, aorta valve disease, aorta valve regurgitation, electrocardiography, heart left ventricle hypertrophy, vectorcardiography, 257 patients, 2323
- aorta subvalvular stenosis, cardiography, echography, mitral valve prolapse, mitral valve stenosis,

- pattern recognition, 3102
- aorta valve prosthesis, phonocardiography, dysfunction detection, 769
- arteritis, atherosclerosis, data base, leg, 839
- artery, atheroma, macroaggregated albumin technetium 99m, technetium 99m, ulcer, videorecording, dog, 1614
- artery pulse, electrocardiography, heart left ventricle ejection time, heart sound, heart systolic time interval, surgery, pdp 11, real time, 851
- artificial heart pacemaker, vectorcardiography, pacemaker assessment, 1858
- artificial heart pacemaker, long term control, pacemaker impulse, 1451
- ascorbic acid, brain, cerebrospinal fluid, extracellular space, mannitol, pharmacokinetics, model, rabbit, 859
- atherosclerosis, cholesterol, densitometry, femoral angiography, cadaver angiograms, 1599
- attitude, history, patients attitudes, 2311
- audioamplifier, electroencephalography, 2708
- audiometry, auditory threshold, 100 subject, computer vs manual audiometry, 3105
- autoanalyzer, 3410
- automation, computer assisted diagnosis, electroencephalography, sleep electroencephalography, sleep waking cycle, review, analysis methods, 1569
- automation, electroencephalography, evoked response audiometry, 855
- automation, heart infarction, heart left ventricle, heart ventricle arrhythmia, automated data processing, 1232
- automation, electroencephalography, frequency analysis, information processing, 776
- automation, electroencephalography, information processing, 773
- autopsy, cancerogenesis, cancer research, data base, mouse strain, organ, pathology, national center for toxicological research, usa, automated pathology information system, 1158
- axoplasm flow, mitochondria, spinal cord, tissue culture, mouse, 2372
- behavior, electrocardiography, hippocampus, behavior quantification, 2758
- behavior, interview, medical record, problem oriented record, 2368
- behavior, health care delivery, information processing, ambulatory patients, 3406
- behavior, interview, assessment, 3050
- bioassay, information processing, radioimmunoassay, desk top computer, 755
- biology, ecology, mathematic model, model, algorithm, 1788
- bladder carcinoma, cancer cytodiagnosis, cell dedifferentiation, urogenital tract, unsupervised learning algorithms, 1156
- bladder carcinoma, cancer cytodiagnosis, cell dedifferentiation, urogenital tract, supervised learning algorithms, classification, 1155
- blood clotting factor, blood clotting time, reference curves, 2306
- blood flow, radiocardiography, scintillation camera, 131 cases, 2349
- blood group typing, information system, lyon, 3793
- blood pressure, central venous pressure, electrocardiography, electroencephalography, monitoring, 781
- body burden, bone, neutron activation analysis, plutonium 239, 811
- body posture, eye movement, stabilography, visual stimulation, 275
- body temperature, core temperature, telemetry, small animals, 2112
- body temperature, circadian rhythm, confinement, heart rate, walking, sheep, 847
- body weight, medical record, obesity, medical condition evaluation, 13110 examinations, 3848
- bone marrow smear, data processing, 3797
- bone scintigraphy, methylene diphosphonate technetium tc 99m, technetium pyrophosphate tc 99m, computer assisted comparison of bone imaging, 350 patients, 2717
- brain angiography, brain artery aneurysm, brain vasospasm, cerebrovascular disease, stethoscope, electronic stethoscope, 6 illustrative cases, 2162
- brain blood flow, cerebrovascular disease, computer program, xenon 133, multiexponential curve fitting, 3482
- brain blood flow, compartment model, information processing, xenon 133, one line, 852
- brain blood flow, scintillation camera, xenon 133, methods, 3063
- brain section, nerve cell network, neuron tree reconstruction from several sections, 3854
- breast biopsy, data base, diagnosis, mammography, pathology, radiography, interclinical cross check, 708 cases, austria, 3430
- breast carcinoma, echotomography, mammography, time of flight echography, 3809
- breast carcinoma, radiotherapy, therapy, computer aided medical decision making, 25 cases, 1593
- breast carcinoma, thermography, computer thermography, 356
- breathing muscle, diaphragm, digital computer, lung, lung volume, rabbit, 1994
- bronchus, ciliary motility, trachea, dogs, new measuring technique, 1237
- cadaver identification, forensic odontology, record storage, identification method, 1556
- caloric intake, nutrient, nutrition, protein, intake estimation, 842
- cancer, neutron therapy, radiotherapy, roentgen dose distribution, G.D.R., 1976

- cancer, cancer registry system, Canada, 2684
- cancer, radiotherapy, roentgen dose distribution, 3064
- cancer chemotherapy, decision, methotrexate, 100 patients, 3053
- cancer cytodiagnosis, microspectrophotometry, uterine cervix carcinoma, uterine cervix cytology, cytology automation, papanicolaou staining, 109 free lying cells, 332
- cancer cytodiagnosis, cytology, data base, simple system, histologic control, 1936
- cell kinetics, radiation dose fractionation, radiation survival, radiotherapy, simulation of radiobiological data, 845
- chromosome analysis, karyotype, lymphocyte, metaphase, microscopy, automatic metaphase finding, 1563
- cineangiocardiology, heart left ventricle ejection fraction, heart ventricle enddiastolic volume, special purpose calculator, 3477
- clinical chemistry, information processing, one line problems, 2691
- clinical chemistry, quality control, laboratory automation, 1562
- clinical chemistry, laboratory test, medical audit, continuing education, control of overutilization, 3794
- clinical laboratory, cost, hospital, 3405
- cobalt therapy, dose calculation, megavoltage radiotherapy, central axis dose, 2741
- coding, computer assisted diagnosis, diagnosis, automatic diagnosis coding, 2313
- compartment model, parameter space, 424
- computer assisted diagnosis, diagnosis, schizophrenia, computer vs clinician, 760
- computer assisted diagnosis, echocardiography, heart catheterization, heart ventricle pressure, information processing, 1233
- computer assisted diagnosis, electrocardiography, mass screening, 772
- computer assisted tomography, radiotherapy, therapy, method, 3417
- computer program, monitoring, 2714
- computer program, emergency ward, information processing, model, statistics, deterministic simulation model, data reconstruction, 2686
- computer program, electrocardiography, telemetry, electric noise, artefact suppression, noise rejection, 2867
- computer program, heart index, heart output, thermodilution curve, on line computation, 850
- contouring device, radiotherapy, roentgen dose distribution, computer compatible, 1917
- contraception, life table, 3040
- coronary care unit, electrocardiography, heart arrhythmia, heart infarction, heart ventricle arrhythmia, 2293
- cost, electrocardiography, task force, 2702
- cost, electrocardiography, monitoring, physician, safety, over and underutilization, contribution to diagnosis, task force, 2701
- countercurrent multiplier system, kidney function, mathematic model, 2457
- counting, pharmacy, tablet, bar code recorder, 1984
- data base, education, gingiva, oral biopsy, tooth care, oral biopsy data, 8 dental schools, usa, 3471
- data base, protein, 2689
- data base, stereotaxic surgery, thalamus, automatic thalamus mapping, 130 cases, 856
- decision, learning, medical education, u.k., 1557
- delivery, fetus, heart rate, labor, pregnancy, 1571
- deoxyguanosine phosphate, erythrocyte sedimentation rate, free radical, gamma radiation, computer analysis of esr spectrum, 2343
- deoxyribonucleic acid, sequence analysis, computer, 3048
- diagnosis, documentation, epidemic, pharmacotherapy, 2329
- diagnosis, lung, radiography, thorax radiography, 2316
- diagnosis, history, u.k., 2312
- differential diagnosis, display system, hand, information processing, parkinsonism, tremor, 1240
- digital analog converter, storage oscilloscope, signal averager, data acquisition, 1786
- digital computer, fluorimeter, gamma counting, spectrometry, 1404
- digital computer, eye movement, signal processing, one line analysis, human, 1229
- digital computer, image processing, information processing, scintigraphy, 1576
- digital computer, electrocardiography, exercise, thorax electric field, precordial isopotential map, 1235
- digital filtering, signal processing, online digital filter, 2118
- dimercaptosuccinate technetium tc 99m, kidney cancer, kidney cyst, kidney scintiscanning, a comparing study, 2718
- display system, nerve cell, ultrastructure construction, 2071
- diving, electroencephalography, olfactory bulb, caiman, analysis, 1168
- doctor patient relation, physician, quality control, 2683
- documentation, literature, lisp, personal documentation, 1982
- dorsal root potential, microelectrode, nerve cell potential, spinal cord posterior horn, substantia gelatinosa, very small neuron, activity isolation method, mouse, 1238
- dosimetry, linear accelerator, megavoltage radiotherapy, 3081

- dosimetry, gold 198, iridium 192, radioisotope therapy, 2723
- dosimetry, fast electron therapy, decrement curve, 2722
- dosimetry, gynecologic cancer, radioisotope therapy, radiotherapy, 1200 cases, 1220
- dosimetry, radiation field, radiotherapy, irregular field computer program, 2358
- dream content, retrieval system, no coding, 2309
- drinking water, mass spectrometry, organic compound, surface water, water pollution, united states, trace analysis, 3796
- drug, drug cost, drug prescription, hospital, nurse, pharmacy, physician, cti modular 1 computer, 3049
- drug analysis, mass spectrometry, pattern recognition, pharmacology, structure activity relation, 3092
- dye dilution curve, heart output, hybrid computer, 3100
- dyspnea, forced expiratory volume, medical record, pneumoconiosis, subjective appreciation, 3847
- echocardiography, 1201
- echocardiography, hemodynamics, m mode, 1986
- echocardiography, 764
- echocardiography, three and two dimensional images, 2337
- echography, echooculography, tissue differentiation, digitization, 3803
- ecology, mediterranean ecosystem, 3607
- electrocardiography, electromyography, information processing, stationarity and normality test, 2326
- electrocardiography, petit mal, spike wave, prolonged recording, on line, 5 cases, 2325
- electrocardiography, diagnosis, 2322
- electrocardiography, heart arrhythmia, analysis, 2319
- electrocardiography, minnesota code, 2318
- electrocardiography, vectorcardiography, impact on cardiologist interpreter of scalar electrocardiogram, 2317
- electrocardiography, frequency analysis, dominant component evaluation, 2760
- electrocardiography, telephone telemetry, remote analysis, 978
- electrocardiography, heart rate, telemetry, one line measurement, bird, 2375
- electrocardiography, heart arrhythmia, heart ventricle extrasystole, counting ectopic beats, 345
- electrocardiography, medical record, monitoring, 24 hr monitoring, 343
- electrocardiography, exercise test, heart rate, baseline estimation, 3422
- electrocardiography, exercise, heart rate, lung function, oxygen consumption, tidal volume, breath-by-breath respiratory measurements, 1615
- electrocardiography, heart arrhythmia, monitoring, 3054
- electrocardiography, task force, 2700
- electrocardiography, heart left ventricle ejection fraction, qrs complex, q wave, r wave, relation qrs forces to left ventricle ejection fraction, 2699
- electrocardiography, exercise test, ischemic heart disease, optimal measurement, 2698
- electrocardiography, heart infarction, 33 cases, polarcardiographic examination of old infarcts, 1165
- electrocardiography, electromyography, ergonomics, error, exercise electrocardiography, heart rate, quality control, 1164
- electrocoagulation, electrode, gastrointestinal hemorrhage, gastroscopy, stomach ulcer, dogs, computer controlled electro coagulation, 3058
- electroencephalography, rem sleep, sleep, spindle, spindle detection, 4 volunteers, 4 patients, phase locked loop, 3424
- electroencephalography, telemetry, 3 channel, automatic noise rejection, 966
- electroencephalography, minicomputer, automation, stationary point detection, 3055
- electroencephalography, signal processing, daily routine, 2710
- electroencephalography, automatic selection, 2709
- electroencephalography, sleep, hypnogram, 2707
- electroencephalography, frequency analysis, psychologic test, wechsler scale, intellectual factor, 56 children, 2704
- electroencephalography, period analysis, normative data, 26 subjects, 1166
- electroencephalography, microcomputer method, simple elements analysis, 777
- electromyography, computer analysis, 3807
- electromyography, intestine motility, intestine sound, computer analysis, rabbit, 3472
- electromyography, motor unit, muscle disease, neuropathy, spike, computer analysis, 26 subjects, 75 muscles, human, 1953
- electromyography, monitoring, 711
- electromyography, motor unit potential, tibialis anterior muscle, 4 subjects, automatic analysis, computer, 3427
- electromyography, jaw, mastication, muscle contraction, man, 1613
- electronystagmography, nystagmus, data processing, 1163
- electrostimulation, heart muscle, heart muscle potential, heart ventricle, 860
- emotional disorder, interview, personal relevance, 3418
- end tidal carbon dioxide tension, functional residual capacity, intensive care, lung function test,

- mass spectrometry, monitoring, 2675
- epidemiology, information processing, mathematic model, 339
- esophagography, esophagus pressure, 25 cases, 3470
- evoked acoustic nerve response, evoked response audiometry, electric response audiometry, normal values, 3853
- evoked cortical response, latent period, digital display, 1618
- eye movement, rapid eye movement, saccadic eye movement, analysis, 3855
- face, facial recognition, 2876
- fast electron therapy, radiation isodose distribution, treatment planning, 3065
- fatty acid ester, gas chromatography, mass spectrometry, phospholipid, triglyceride, 3047
- fetus hypoxia, fetus monitoring, pregnancy, 106 cases, computer analysis, deceleration delay index, 2327
- first heart sound, analysis, normal human, 3265
- gait, locomotion, computer analysis, 3473
- gait, automatic analysis, 1996
- gas exchange, lung function test, lung ventilation, 1992
- general practice, health center, health visitor, information processing, medical record, nursing, public health service, social worker, real time management, great britain, 840
- glaucoma, perimetry, visual field, 2379
- glucose regulation, monitoring, in dogs, 1230
- health care delivery, library, medical documentation, patient care, public health service, patient care, literature coordination, 2695
- hearing, sound, modulation analysis, bird, 3850
- heart arrhythmia, his bundle potential, tachycardia, extra stimulus measurement method, 3099
- heart arrhythmia, heart failure, heart infarction, intensive care, pneumonia, 1031 cases, 3090
- heart arrhythmia, heart ventricle extrasystole, monitoring, 18 cases, 3056
- heart catheterization, hemodynamics, 3097
- heart catheterization, heart output, heart stroke volume, lung artery pressure, lung blood volume, mitral valve stenosis, radiocardiography, mitral valve area, 33 patients, 2754
- heart infarction, prognosis, stroke, interactive computer program, 3042
- heart left ventricle ejection fraction, heart left ventricle performance, heart scintigraphy, scintiangiocardiology, 25 cases, 2332
- heart muscle conduction system, heart muscle potential, isolated heart, analysis, dog, 1234
- heart muscle contractility, calculation, cat, 2374
- heart output, thermomodulation curve, evaluation flow bench, 3101
- heart output, radioactive microsphere, calculation, pdp 11, 3096
- heart output, intensive care, monitoring, 2711
- heart rate, monitoring, on line statistical analysis, 2713
- heart surgery, infusion, intensive care, monitoring, postoperative care, alabama, 2712
- heart transplantation, information processing, pathophysiology, canada, phocar system, 3851
- heart valve prosthesis, mathematic model, thrombogenesis, tilting disk prosthesis, thrombogenic site prediction, 1236
- heart ventricle activation, wolff parkinson white syndrome, computer simulation, 2697
- hippuric acid i 125, renal plasma flow, scintillation camera, rat, 1069
- histopathology, microscopy, optical marker, microscopy data, quantitative analysis, 983
- hospital, information processing, kulmbach hospital, 3414
- hospital admission, 2308
- hospital management, medical record, uk, nhs, 3089
- hospital management, patient, real time, london hospital project, 2687
- image processing, radiography, image storage, image retrieval, roentgen tele data system, 1595
- image processing, nuclear medicine, 3465
- information processing, digital logger, automatic tabular results, 3213
- information processing, medical record, radiotherapy, 1196
- information processing, medical record, 841
- information processing, ophthalmology, programmed system, 1152
- information processing, primary health care, micro computer, norway, 1146
- information processing, information retrieval, applications in medicine, patient monitoring, 2877
- information processing, mass spectrometry, review, method evaluation, clinical chemistry, 334
- information processing, newborn, respiratory distress syndrome, 3852
- information processing, ophthalmology, mini and micro computers, automatic perimetry, 1560
- information system, nuclear medicine, radiography, automated system, 1971
- information system, intensive care, medical record, newborn, data error rate, 2364
- inheritance, sex chromosome aberration, vectorcardiography, semiautomatic procedure, 770
- iodohippurate sodium i 131, kidney blood flow, 853
- kidney transplantation, nephrectomy, misleading data base, 854

- krypton 81m, lung ventilation, mathematic model, scintillation camera, clinical examples, lung ventilation measurement, 1475
- laboratory diagnosis, liver disease, liver function, monitoring follow-up, human, 3798
- light diffraction, muscle contraction, muscle fiber, muscle tetanic contraction, sarcomere, frog, in vitro, 2373
- linear accelerator, therapy, tissue maximum ratio, 2359
- linear accelerator, radiotherapy, therapy, 2334
- lung, lung disease, mathematic model, scintillation camera, washout curve, xenon 133, and normals, 380
- lung closing volume, respiratory tract disorder, determination, 1991
- lung compliance, lung mechanics, mathematic model, thorax, least square method, modified forced oscillation technique, 1270
- lung function test, 1993
- macroaggregated albumin technetium 99m, scintiangiocardiography, scintillation camera, videorecording, 3818
- malignant hypertension, sodium nitroferriocyanide, microprocessor, 3057
- mathematic model, multiple trauma, nomogram, prognosis, respiration, trauma, 2 prognostic indices, 172 cases, 426
- mathematic model, mortality, multiple trauma, trauma, trauma indices, predictions, 425
- mathematic model, pathophysiology, 406
- mathematic model, retina detachment, retina rupture, sclera buckling procedure, computer localisation, 2314
- medical education, medical school, multiple choice test, u.k., 1558
- medical education, graduate education, conceptual model, canada, 3792
- medical record, radiotherapy, case recording, 3804
- medical record, nomenclature, 3085
- medical record, surgery, machine output, rationalization, 1224
- medical record, large computer, computerization problem, 2367
- medical record, radiotherapy, data entry system, 3456
- medical record, mini record, johns hopkins hospital, 1567
- medical record, obstetrics, perinatology, statistics, 370
- mental health, missouri actuarial report system, 3484
- microcomputer, monitoring, unibed system, 2328
- monitoring, trend, 1170
- morphometrics, myelin, nerve cell, rat, 2303
- motor activity, recording device, 3478
- muscle fiber contraction, muscle tone, tensiometer, electro optical transducer, tension fluctuation, single muscle contraction, 2422
- muscle spindle, nerve potential, primary ending, cat, averager, computer method, cross correlating technique, 1325
- nerve cell, stimulus, threshold, 2757
- neutron detection, nuclear reactor, reactivity meter, 1823
- nuclear medicine, dynamic study, 3834
- nuclear medicine, quality control, 3833
- optic density, tooth radiography, 2354
- optic disk, optic disk cup, 226 healthy subjects, 846
- parathyroid gland, parathyroid scintiscanning, pertechnetate acid tc 99m, radium, scintiscanning, toluidine blue i 131, preoperative localization, 3440
- performance, quality control, sport, training, decathlon, model analysis, computer generated scoring tables, 3475
- pharmacokinetics, iteration program, 3093
- phonation, pitch, pitch extraction, 2752
- photometry, photon, 188
- questionnaire, target orientated construction, 2693
- radiography, computer assisted reporting, 2350
- radiography, automatic pathology diagnostic feedback, 3839
- radioisotope therapy, roentgen dose distribution, computerization of afterloading system, 1958
- radiotherapy, therapy, 3 dimensional treatment planning system, 3083
- respiration center, respiration control, mathematical model, 379
- roentgen generator, micro computerized generator, 2355
- scintigraphy, archive storage, heidelberg, 1974
- scintigraphy, scintillation camera, system for clincom apparatus, 1972
- scintillation camera, camera deadtime correction, 1605
- scintiscanning, thin layer chromatography, pdp 12, 754
- spermatozoon motility, evaluation, 1157

- statistics, constant function curve, 538
- suicide attempt, attempter identification, 1149
- thrombocyte count, particle counter, computer, 2688
- touch, bibliography, 1983
- toxicology, protocol study, computer program, 1937
- u wave, vectorcardiography, 108 cases, u vector, summation by computer, 2320
- vectorcardiography, automatic analysis, 2324
- vectorcardiography, 2321
- vectorcardiography, 3423
- computer analysis**, automation, chromosome analysis, histogram, mitosis, automated classification, 2300
 - cell count, mast cell, image analysis, quantimet 720, 3408
 - cell nucleus, endometrium carcinoma, endometrium hyperplasia, pattern recognition, quantitative microscopy, 2956
 - cell shape, pattern recognition, software system, pdp12 computer, 3407
 - cell shape, image display, pattern recognition, microscopic image, interactive measurements, program system, 2298
 - chromosome analysis, karyotyping, pattern recognition, computer assisted analysis, 2302
 - chromosome analysis, sister chromatid exchange, exchange frequency, automatic measurement, 2301
- computer assisted diagnosis**, abdominal pain, acute abdomen, computer, 1537 patients, diagnosis, 1161
 - algorithm, decision, decision theory, diagnosis, 336
 - anemia, computer teaching, hematology, model, computer vs non computer, france, 2690
 - automation, computer, electroencephalography, sleep electroencephalography, sleep waking cycle, review, analysis methods, 1569
 - brain ventricle, computer assisted tomography, hydrocephalus, volume determination, 805
 - breast cancer, classification, medical record, treatment selection, 26 cases, 761
 - cancer diagnosis, lung carcinoma, thorax radiography, 482 cases, 2724
 - coding, computer, diagnosis, automatic diagnosis coding, 2313
 - computer, diagnosis, schizophrenia, computer vs clinician, 760
 - computer, echocardiography, heart catheterization, heart ventricle pressure, information processing, 1233
 - computer, electrocardiography, mass screening, 772
 - computer program, diagnosis, genetic polymorphism, parenthood, paternity, 3419
 - data base, dyspepsia, stomach cancer, 762
 - diagnosis, differential diagnosis, meningitis, statistical diagnosis, clinical diagnosis, 1565
 - hematology, 3802
 - hyperthyroidism, 359 patients, 763
 - keratoconjunctivitis sicca, rheumatoid arthritis, 3420
- computer assisted tomography**, abdomen, thorax, 3447
 - abdomen, gallbladder disease, liver disease, varian six second body scanner, 34 cases, 1185
 - abdomen scintiscanning, abdominal abscess, abscess scanning, echography, gallium 67, 22 cases, 1175
 - abdominal cancer, cancer staging, lymphography, malignant lymphoma, 30 cases, 1601
 - abdominal radiography, pancreas carcinoma, 574 cases, 1180
 - abdominal radiography, contrast medium, kidney cancer, case report, man of 79, 823
 - abdominal wall, metastasis, radiotherapy, uterine cervix carcinoma, case report, 3812
 - abdominal wall, radiotherapy, therapy, tumor, whole body radiation, 16 years old girl, 1181
 - absorption spectroscopy, estimation of chemical composition and density, 1598
 - acoustic nerve neurinoma, chordoma, hypophysis adenoma, skull base, 801
 - acoustic nerve neurinoma, cisternography, metrizamide, neurinoma, pons angle tumor, 10 cases, 3841
 - acoustic nerve neurinoma, brain infarction, brain tumor, posterior cranial fossa tumor, 191 cases, 3835
 - acute pancreatitis, chronic pancreatitis, pancreas cancer, 121 cases, 820
 - adrenal cancer, kidney anomaly, kidney cancer, survey, 3071
 - age, brain cortex, hemianopia, hemiparesis, partial epilepsy, temporal lobe epilepsy, 11 out of 500 children, 788
 - age, brain ventricle, sex, 170 examinations, age, sex, 3444
 - age, brain sulcus, brain ventricle, third brain ventricle, cella media, 100 normal adults, 3443
 - age, cerebellum atrophy, lennox gastaut syndrome, 38 cases, etiology, 2735
 - aged, brain hematoma, brain infarction, brain tumor, cerebrovascular accident, stroke, subdural hematoma, diagnostic value, 3830
 - alcoholism, alzheimer disease, brain atrophy, dementia, multiple sclerosis, parkinson disease, progressive multifocal leukoencephalopathy, schilder disease, survey, 358
 - algorithm, fourier transform, image processing, 2342
 - althesin, brain blood flow, brain ischemia, brain scintigraphy, xenon 133, 158 cases, 2730
 - angiography, brain angiography, superior mesenteric angiography, method, case series, 1205
 - ankylosing spondylitis, cauda equina, myelography, case report, man of 68, 3074
 - anticoagulant agent, femoral neuropathy, retroperitoneal hematoma, 2 case reports, 3060

- aphasia, brain infarction, embolism, medial brain artery, stroke, 60 cases, 1195
- arachnoiditis, brain artery aneurysm, brain hemorrhage, subarachnoid hemorrhage, 8 cases, 1578
- arnold chiari malformation, metrizamide, myelography, syringomyelia, 20 cases, 3765
- arteriovenous fistula, brain angiography, brain hematoma, brain hemorrhage, 78 cases, 3845
- arteriovenous malformation, cerebellum tentorium, subarachnoid hemorrhage, vein sinus, vein thrombosis, normal ct appearance, nonneoplastic pathology, 1596
- arteriovenous malformation, spinal cord, 4 cases, 834
- arteriovenous malformation, brain angiography, brain arteriovenous fistula, 22 cases, 361
- aspiration biopsy, guiding of percutaneous biopsy, 830
- astrocytoma, brain tumor, central nervous system metastasis, craniopharyngioma, hypophysis adenoma, meningioma, 1658 cases, 817
- astrocytoma, corpus callosum tumor, evoked visual response, occipital cortex, optic radiation, 51 yr old man, necropsy, histopathology, 3724
- atherosclerosis, basilar artery ectasia, brain angiography, 4 cases, 363
- atlantoaxial dislocation, craniovertebral malformation, 2 cases, 1179
- atlas fracture, case report, 828
- atomic number, brain cyst, colloid cyst, electron density, method, 12 cases, 2333
- biopsy, nerve block, interventional scanning, 160 cases, 2743
- bladder cancer, survey, 3449
- bladder carcinoma, cancer staging, experience, 786
- bladder carcinoma, pelvis, pelvis cancer, prostate, survey, 3450
- blindness, epiphora, exophthalmos, headache, mucocele, ophthalmoplegia, paranasal sinus, ptosis, 4 cases, 2737
- blood, cerebrospinal fluid, quantitative aspects, fresh and coagulated blood, 832
- bone mineral, photon absorption, dual energy tomography, 3445
- brain, brain vascularization, contrast intensification, normal tomogram, 2000 scans, 796
- brain, cost effectiveness, 3077 scans, 3825
- brain, dementia, diagnosis, overreliance, 1964
- brain, brain edema, brain tumor, electron density, tomochemical analysis, 2740
- brain, skull, vertex scan, analysis 2000 examinations, 3838
- brain, brain lesion, head trauma, 100 pediatric cases, 3757
- brain abscess, density, encephalopathy, glioblastoma, measurement of mean density, 798
- brain abscess, brain angiography, brain scintigraphy, encephalitis, case, 377
- brain abscess, brain angiography, 22 cases, 785
- brain abscess, brain scintigraphy, brain tumor, meningioma, posterior fossa, subdural hematoma, review, 1194
- brain abscess, 60 patients, 1192
- brain abscess, brain hemorrhage, brain infarction, brain tumor, encephalitis, meningitis, 80 children, 3462
- brain abscess, empyema, epidural space, subdural empyema, 15 patients, 3438
- brain angiography, hypophysis adenoma, pneumoencephalography, 12 cases, 792
- brain angiography, brain hemangioma, hemangioma, 6 cases, 806
- brain angiography, brain artery aneurysm, brain hematoma, 56 patients, clinical study, 1193
- brain angiography, brain tumor, cerebellum tumor, ependymoma, hemangioblastoma, medulloblastoma, 22 children, 3455
- brain angiography, brain scintigraphy, cerebrovascular accident, stroke, review, 1587
- brain angiography, brain edema, brain infarction, brain tumor, survey, 1174
- brain angiography, brain tumor, hypophysis tumor, ophthalmology, parasellar tumor, pneumoencephalography, sella turcica tumor, false negative diagnosis, 4 cases, 818
- brain angiography, brain artery aneurysm, brain scintigraphy, pneumoencephalography, sella turcica tumor, sellar and parasellar lesions, 76 in 5000 cases, 2731
- brain angiography, brain falx, epidural abscess, otitis media, subdural empyema, 11 yr old girl, neurosurgery, interhemispheric localization, 3062
- brain angiography, brain cancer, brain scintigraphy, glioma, case report, 3439
- brain aqueduct, brain stem, brain tomography, dorsum sellae, fourth brain ventricle, transverse cut, frontal cut, clivo parallel cut, method, human brain model, 2716
- brain aqueduct, 5 cases, 1212
- brain arachnoid cyst, brain cyst, cerebrospinal fluid, cisternography, metrizamide, 4 cases, 3441
- brain arachnoid cyst, hydrocephalus, pneumoencephalography, sella turcica, third brain ventricle, case report, man of 19, neurosurgery, 1588
- brain artery aneurysm, brain hemorrhage, brain tumor, central nervous system metastasis, chromophobe adenoma, coronal and sagittal reconstruction, 3452
- brain artery aneurysm, subarachnoid hemorrhage, 46 cases, 1579
- brain atrophy, brain scintigraphy, melanodermic leukodystrophy, X chromosome recessive inheritance, 2 cases, 3816

- brain atrophy, electroencephalography, epilepsy, head trauma, traumatic epilepsy, 78.070.297.P cases, 2336
- brain atrophy, brain calcification, brain ischemia, brain tomography, brain tumor, electroencephalography, partial epilepsy, porencephaly, 200 cases, 787
- brain atrophy, brain hemorrhage, head trauma, hydrocephalus, skull fracture, subdural hematoma, trauma, diagnosis, 1581
- brain atrophy, central nervous system metastasis, electroencephalography, encephalitis, epilepsy, partial epilepsy, tonic clonic epilepsy, 99 cases, 829
- brain atrophy, cannabis, drug abuse, no evidence, 19 patients, 1577
- brain atrophy, brain tumor, leukoencephalopathy, progressive multifocal leukoencephalopathy, 3 cases, neuropathology, 2 autopsies, ultrastructure, diagnosis, 365
- brain blood flow, brain scintigraphy, edetic acid, gallium 68, krypton, positron emission tomography, positron scintiscanning, 120 cases, 799
- brain blood flow, contrast medium, xenon, phantom study, monkey, 789
- brain blood flow, medial brain artery occlusion, xenon 133, monkey model, 1584
- brain blood flow, contrast intensification, xenon, baboon, 3461
- brain contusion, cerebrovascular disease, glioblastoma, hydrocephalus, meningioma, 1215
- brain cortex, brain white matter, differentiation, 360
- brain cyst, porencephaly, 8 cases, 815
- brain cyst, brain tumor, cerebrospinal fluid, absorption coefficient, 11 cases, differential diagnosis, 2340
- brain edema, brain hernia, brain tumor, metastasis, ascending transtentorial herniation, 7 cases, 3837
- brain edema, brain ventricle, cerebrospinal fluid, ependyma, hydrocephalus, 4 patients, transependymal csf absorption, 2736
- brain hematoma, brain tumor, headache, head trauma, hydrocephalus, mental deficiency, seizure, 795
- brain hematoma, brain stem compression, cerebellum hemorrhage, hypertension, neurosurgery, 10 cases, 3827
- brain hematoma, brain hemorrhage, echoencephalography, electroencephalography, 33 patients, 2720
- brain hematoma, stereotaxic surgery, case report, screw action technique, 3453
- brain hematoma, brain stem contusion, coma, head trauma, hygroma, 1000 consecutive patients, 1582
- brain hemorrhage, epidural hemorrhage, subdural hematoma, attenuation value, 14 cases, 800
- brain hemorrhage, brain tumor, brain ventricle, stroke, 3454
- brain hemorrhage, 83 cases, diagnosis, 819
- brain hemorrhage, hematoma, ring blush, 7 cases in 58, 362
- brain hemorrhage, transient ischemic attack, 6 cases, 3846
- brain hemorrhage, head trauma, meningorrhagia, 1173
- brain hemorrhage, brain hernia, brain tumor, transtentorial herniation, 4 cases, 766
- brain infarction, brain tumor, sella turcica, skull base, sagittal and coronal scan, 3824
- brain infarction, brain tumor, contrast intensification, subtraction method, 19 cases, 2733
- brain ischemia, head trauma, hydrocephalus, 457 cases, 833
- brain lesion, neurinoma, spinal cord lesion, syringomyelia, diagnosis, 1190
- brain malformation, brain tumor, congenital malformation, histogenesis, organogenesis, skull defect, computed tomography, indication, 1223
- brain pseudotumor, lead encephalopathy, lead poisoning, case report, 816
- brain scintigraphy, heart infarction, scintillation camera, technetium 99m, 25 cases, dog heart infarction, emission computed tomography, maate 99m, 1200
- brain scintigraphy, brain tumor, pertechnetate acid tc 99m, comparison, 190 cases, 1183
- brain scintigraphy, brain tumor, glioma, multifocal glioma, case, 2338
- brain tomography, diatrizoate, case series, 791
- brain tomography, meningioma, optic nerve, visual field defect, woman of 44, 1586
- brain tomography, contrast intensification, resolving power, 2346
- brain tumor, radiotherapy, 26 cases, 3814
- brain tumor, contrast intensification, diatrizoate, case series, 3079
- brain tumor, stereotaxic surgery, 52 cases, 3078
- brain tumor, image processing, digital display, 1590
- brain tumor, cisternography, metrizamide, suprasellar mass, 10 cases, 1589
- brain tumor, diatrizoate, glioma, hypophysis adenoma, meningioma, non contrast scanning, 299 cases, 3457
- brain tumor, infratentorial tumor, posterior cranial fossa tumor, 51 cases, 1187
- brain tumor, electroencephalography, 111 cases, 1574
- brain tumor, orbit tumor, histographic analysis, 88 tumors, 1213
- brain tumor, 72 patients, diagnosis, 1204
- brain tumor, hydrocephalus, pneumoencephalography, 725 scans, 757
- brain tumor, pineal body, pinealoma, 8 cases, classification, 2732
- brain tumor, radiotherapy, evaluation therapeutically induced changes, 25 cases, 3072
- brain tumor, epidermoid tumor, 2 cases, 364
- brain tumor, 6000 cases, 767

- brain ventricle, computer assisted diagnosis, hydrocephalus, volume determination, 805
- brain ventricle, brain ventriculography, echoencephalography, 192 cases, 1585
- brain ventricle, cerebrospinal fluid shunting, hydrocephalus, porencephaly, 4 cases, motor deficit, 1575
- brain ventricle, 1211
- brain white matter, cerebellum, posterior fossa, cerebellum white matter, 3821
- brain white matter, demyelination, multiple sclerosis, optic nerve, 100 cases, diagnosis, 3829
- bronchography, contrast medium, krypton, lung ventilation, xenon, phantom study, 790
- calorimetry, dosimetry, echography, ultrasonics, megahertz frequency, 1197
- cancer, radiotherapy, diagnostic role, 809
- cancer, radiotherapy, whole body scanning, treatment planning, follow up, 167 cases, 2345
- cerebellum, hemangioblastoma, spinal cord, von hippel lindau disease, case report, 3073
- cerebellum hemorrhage, cerebellum infarction, cerebrovascular accident, vertebral artery angiography, review, 1191
- cerebellum vermis, meglumine diatrizoate, pseudotumor, diagnostic pitfall, 5 cases, 1967
- cerebrospinal fluid, hydrocephalus, normotensive hydrocephalus, penthanil yb 169, scintiscintigraphy, subarachnoid hemorrhage, 54 cases, 2721
- cerebrospinal fluid flow, cisternography, metrizamide, 25 cases, 812
- cervical spine, head, skull base, coronal head scan, 1214
- chorionic gonadotropin, alpha fetoprotein, retroperitoneal cancer, testis cancer, 4 cases, 3822
- choroid tumor, hemangioma, 3 cases, diagnosis, 765
- cobalt therapy, radiation isodose distribution, therapy, phantom, 3075
- collimator, collimator performance, emi scanner, 3801
- computer, radiotherapy, therapy, method, 3417
- computer program, modulation transfer function, scintillation camera, tomoscintigraphy, evaluation of depth effect, 2347
- cost benefit analysis, diagnosis, epilepsy, headache, temporal lobe epilepsy, 107 cases, u.s.a., 1209
- craniopharyngioma, 5 year old girl, 1184
- craniopharyngioma, exophthalmos, hemianopia, orbit, subarachnoid cyst, boy of 7, 2738
- creutzfeldt jakob disease, encephalopathy, slow virus disease, 2 cases, 1603
- cystadenoma, pancreas tumor, case report, 3464
- densitometry, gamma radiation, radiation scattering, roentgen radiation, compton scatter, 810
- densitometry, liver, whole body tomography, 120 cases, 1564
- diaphragm crus, 100 cases, 3815
- diaphragm hernia, mediastinum mass, mediastinum tumor, omentum, omentum hernia, case report, 1207
- diatrizoate, thyroid gland, 1591
- digital filtering, image processing, scintigraphy, e filter, 2 dimensional filter, 825
- dosimetry, film dosimeter, dosimetry system, 3082
- dosimetry, deltascan 50 scanner, 1594
- echinococcosis, liver cyst, case report, 3800
- echocardiography, exercise, heart catheterization, oxygen consumption, phonocardiography, invasive and noninvasive evaluation, human subject, 3416
- echography, kidney, pancreas, spleen, differential diagnosis, case report, 3817
- echography, malignant fibrous histiocytoma, pancreas pseudocyst, diagnosis of homogeneous mass, histopathology, 1186
- echography, radiotherapy, therapy, cross section determination, 2360
- echooculography, hyperthyroidism, neuropathy, orbit cancer, orbit nerve, orbit tumor, 144 cases, 1221
- edetate gallium ga 68, positron scintiscanning, scintillation camera, technetium 99m, emission computer assisted tomography, comparison, 1177
- electroencephalography, neuroradiology, comparison, 1202
- electroencephalography, organic psychosis, psychosis, 12 children, 3446
- electroencephalography, frequency analysis, scalp. 350 intracerebral organic lesions, 3425
- electroencephalography, evoked somatosensory response, stroke, human, 2335
- empty sella syndrome, 26 cases, 804
- endoscopic retrograde cholangiopancreatography, kidney disease, liver disease, liver scintiscanning, pancreas disease, retroperitoneal disease, tomography, 359
- epidural hematoma, subdural hematoma, 30 patients, 3434
- esophagus, ureter, 200 cases, 3844
- evoked acoustic nerve response, olivopontocerebellar atrophy, 3 cases, method, 3820
- exophthalmos, hemangioma, meningioma, myositis, tumorous and nontumorous exophthalmos, 90 cases, 802
- exophthalmos, eye foreign body, lens luxation, orbit tumor, retinoblastoma, 33 cases, 2742
- eye foreign body, foreign body localization, orbit, perforating eye injury, 8 cases, 794
- face, mucocele, paranasal sinus, rhinopharynx cancer, skeleton, 1962
- face, skull, tomography, 1580
- face, orbit, paranasal sinus, skull, coronal section, 35 cases, 2729

- face cancer, rhinopharynx cancer, skull base* cancer, 50 cases, 3442
- fluoroscopy, videorecording, 1963
- fourier transform, modulation transfer function, 3 d image, 1978
- fourier transform, image processing, gamma radiation, scintigraphy, 1218
- fourier transform, image processing, 368
- gamma counting, noise, statistics, general expression, 1176
- gaze paralysis, hemiplegia, miosis, thalamus hemorrhage, 18 cases, 814
- gonad radiation, radiation exposure, thermoluminescence dosimeter, 121 cases, emi scan, 2727
- gray scale echography, prostate, prostate carcinoma, prostatitis, 8 cases, 2739
- head holder, no water bath, 1969
- head trauma, subarachnoid hemorrhage, 109 children, 3758
- heart, gated tomography, 3811
- heart, heart arrest, heart function, isolated heart, dog, 1604
- heart, heart infarction, 9 human hearts, in vitro, 1600
- heart edema, heart muscle ischemia, dog heart, 1219
- hematoma, hydrocephalus, subdural hygroma, postoperative evaluation, 3813
- hemochromatosis, hemosiderosis, liver, excessive iron storage, 14 patients, 12 healthy controls, 803
- hepatography, liver cancer, liver cyst, pancreas disease, 120 cases, whole body tomography, 831
- hereditary cerebellar ataxia, spinocerebellar degeneration, woman of 61, 3066
- holography, 3 dimensional display, 1961
- hydrocephalus, treatment, follow up, 1583
- hydrocephalus, pneumoencephalography, porencephaly, children, 1210
- hydrocephalus, macrocrania, 93 children, 3764
- hydronephrosis, kidney arteriography, kidney cancer, kidney cyst, 70 cases, 824
- hyperparathyroidism, mediastinum, neck, parathyroid adenoma, 10 cases, 797
- hypophysis adenoma, parasellar tumor, sella turcica, empty sella, 1188
- image display, graphic display system, 1975
- image display, digital display system, 3832
- image processing, review, 1977
- image processing, 1970
- image processing, roentgen radiation, 1217
- image processing, scintigraphy, signal noise ratio, image restoration, 2362
- image processing, radiography, roentgen radiation, scintigraphy, scintillation camera, calculus, 2348
- image processing, image blur, deblurring, 367
- image processing, singular value decomposition, 366
- image processing, pattern recognition, shape discrimination, circle transform, 2339
- image processing, radiography, 3782
- image processing, sampling, arbitrary sampling, 3779
- image production, polaroid image, 1178
- information retrieval, 821
- intrahepatic bile duct, liver, portal vein, simulation of dilated biliary ducts, 23 cases, 1206
- intraorbital foreign body, orbit tumor, coronal tomography, 29 cases, 3436
- iodized contrast medium, k edge energy, 2734
- ionization chamber, radiation detection, roentgen radiation, xenon, fan beam computed scanner, 3810
- juvenile hemangiofibroma, rhinopharynx tumor, 3 cases, 3458
- kidney abscess, kidney carcinoma, kidney cyst, 180 cases, 3080
- leukoencephalopathy, methotrexate, myeloid leukemia, necrotic leukoencephalopathy, computed tomography, woman of 39, female 39 yrs, clinical course, 371
- liver, pancreas, thorax, 354
- liver, survey, 3068
- liver disease, 600 examinations, 826
- lung cancer, lung metastasis, lung nodule, nodule detection, 357
- lung parenchyma, thorax wall, 3067
- lung sarcoidosis, sarcoidosis, 6 cases, 2356
- metrizamide, spinal cord disease, syringomyelia, tumor, vertebral canal stenosis, 3 cases, 2357
- modulation transfer function, emi head scanner, 3460
- modulation transfer function, emi scanner, 768
- moyamoya disease, 20 cases, 1203
- multiple sclerosis, 3 cases, 3828
- myasthenia gravis, thymoma, tomography, 6 cases, 3415
- nephrostomy, pyelography, 2 cases, 827
- neurosurgery, postoperative care, 784
- nose cavity, otorhinolaryngology, paranasal sinus, pons angle, applications, 9 selected cases, 2719
- orbit, superior ophthalmic vein, high resolution tomography, 200 cases, 1606

- orbit, orbit tumor, tomography, 213 cases, 1189
- orbit radiography, sagittal tomography, 3 cases, 3437
- orbit tumor, skull base tumor, whole body scanner indication, 2696
- pancreas, survey, 3448
- pancreas, survey, 3069
- pneumoencephalography, comparison, 813
- positron emission tomography, basic principle, 3842
- positron emitter, scintiscanning, principles, 1957
- gamma radiation, scintigraphy, stochastic model, 1016
- radiotherapy, therapy, efficiency, 2726
- radiotherapy, therapy, 3843
- radiotherapy, therapy, 3831
- retroperitoneal space, survey, 3070
- roentgen radiation, signal noise ratio, 1199
- roentgen radiation, radiation transmission, 1182
- scintillation camera, humongotron, 1597
- skull, sturge weber syndrome, 1 child, 1 adult, 1573
- skull, tuberous sclerosis, 20 children, 3061
- spina bifida, spinal cord disease, spinal cord tumor, spine disease, 12 cases, 808
- stereoradiography, 3 dimensional information display, 807
- stomach disease, short survey, diagnosis, 3451
- subdural hematoma, xenon 133, contrast enhancement, case report, man of 54, 3052
- tomography, comparison, 3076
- tomoscintigraphy, half back projection, 3421
- trunk, 1000 cases, 2344
- vertebral canal, vertebral canal stenosis, toshiba unit, 3819
- image analysis, rubber circle, 1968
- localization, 793
- medical, economic aspects, 1216
- energy dependence, quantitative theory, hounsfield unit, 2725
- present role, future prospect, 3077
- high speed, 2352
- slice geometry, 1602
- slice geometry, 1208
- emission computed tomography, 1959
- collimator width correction, 1592
- split detector tomography, 2694
- tomogram localization, 3826
- tomogram labelling, emi, 2353
- fan beam geometry, 2351
- whole body tomography, 3429
- cross sectional atlas, 2336
- correlation emi number with physical properties, 1960
- survey, 353
- water box substitute, emi scanner, 3808
- artifact correction, 3823

computer interface, ad converter, digital computer, image processing, scintigraphy, scintillation camera, 3014

- computer program, digital computer, man machine interaction, speech, duvo, 3088
- digital computer, medical record, speech synthesizer, telephone enquiry, 3086
- digital computer, history, information processing, voice response system, 1160
- digital computer, speech, speech pitch measurement, 64

computer memory, analog computer, signal processing, delay line, ccd, 984

- analog computer, information processing, 2119
- analog digital converter, digital filtering, read only memory, 1373
- digital computer, digital recording, information processing, strip chart recorder, address indicator, 991
- digital computer, development, 542
- image processing, minicomputer, television camera, 2514
- low frequency generator, sine wave generator, digital generator, 959
- bubble memory, design, 141

computer model, acceleration, head, impact, mathematic model, neck, motor vehicle crash victim, calspan 3 d computer simulator, 2426

- acetylcholine, cholinergic system, dopamine, dopamine system, extrapyramidal system, haloperidol, theoretical aspects, 3328
- adenosine, adenosine triphosphate, adenylcyclase, coronary artery blood flow, cyclic amp,

- heart muscle ischemia, hypoxanthine, inosine, noradrenalin, rat, 872
- adenosine triphosphatase, glycogenolysis, glycolysis, heart perfusion, hypoxia, lactate permease, rat, 2170
- adenylcyclase, cyclic amp, heart muscle ischemia, hypoxanthine, inosine, noradrenalin, phosphodiesterase, vasodilatation, rat, 2452
- aircraft accident, computer program, injury, calspan gross motion simulation code, digital computer simulation, 2649
- aldosterone, angiotensin, blood volume, kidney function, vasopressin, 1311
- angiography, blood vessel, phantom, 1862
- angular acceleration, vestibular system, vestibuloocular reflex, white noise, computer simulation, cross correlation analysis, white noise input, cat, 1286
- artery pulse, blood flow, heart output, heart stroke volume, 2065
- attention, task performance, 1633
- auditory system, evoked cortical response, signal noise ratio, human, 3483
- barium, nerve cell membrane potential, tetrodotoxin, aplysia, 2467
- behavior, model, sexual behavior, newt, 395
- bile, bromsulfophthalein, drug interaction, pharmacokinetics, warfarin, 3498
- binocular vision, depth perception, scheme, 691
- biological model, muscle fiber membrane, muscle fiber membrane resistance, cable model, parameter determination, 1317
- biological model, model, oxygen transport, 2451
- bladder, neurogenic bladder, model, 2458
- blood vessel resistance, indicator dilution curve, model study, dog, intravenous administration, 2455
- body plethysmography, lung compliance, respiration, 439
- body weight, hunger, satiety, review, computer simulation, control mechanism, 867
- brain, nonlinear system, oxygen consumption, 2627
- cancer, image processing, information processing, scintigraphy, normal brain, 2341
- cell growth, 3682
- cell motion, embryo motility, engulfment, 3317
- cerebellum, mathematic model, nerve cell network, purkinje cell, frog, 487
- cerebellum cortex, compartment model, muscle fiber, nerve cell network, 1729
- cerebellum cortex, mathematic model, nerve cell network, purkinje cell, frog, 1717
- chemical kinetics, molecular structure, nutrition, chemoton, 610
- chemical kinetics, diffusion, pattern recognition, activator inhibitor, 2397
- chemical kinetics, enzyme, multiple pathway reaction, 1254
- chemical kinetics, coupled reaction, 23
- chemical kinetics, evolution, life, mathematic model, prokaryotic cell, 2774
- chloroplast, photosynthesis, translocator, kinetic model, 402
- circadian rhythm, ethanol, fluid intake, mouse, 400
- cobalt therapy, mathematic model, radiotherapy, 1965
- compartment model, computer program, structural identification, 415
- compartment model, parameter extraction, 2786
- coordination, leg movement, walking, insect, 1278
- countercurrent multiplier system, kidney tubule absorption, mathematic model, sodium, urea, transient simulation, steady state simulation, 473
- countercurrent multiplier system, gas exchange, mathematic model, swimming device, 913
- covariance, statistics, ratio use, 3122
- diffusion, nonlinear system, population model, 1257
- digital computer, diuresis, kidney tubule absorption, sodium, sodium depletion, water, 478
- digital computer, motivation, sexual behavior, male rat, 2393
- digital computer, electric field, steady potential, 82
- digital computer, parallel array, 2121
- digital computer, man machine interaction, 2525
- digital computer, glucose tolerance test, insulin, plasma, proinsulin, 18 patients, 2767
- diuresis, vasopressin, model aspects, 2960
- ecology, model simplification, 3506
- electrocardiography, multipole expansion, 1941
- energy transfer, glucose, glycolysis, heart muscle, heart perfusion, nicotinamide adenine dinucleotide, reduced nicotinamide adenine dinucleotide, rat, 1631
- epidermis, skin permeability, sodium, frog, 870
- eye, optics, geometrical optics, ray tracing, 1289
- eye movement, retina image, target, target point selection, 3 volunteers, 1698
- heart atrium, heart muscle contractility, heart ventricle, 3147
- heart left ventricle, heart muscle, isolated heart, 3 dimensional finite element analysis, 1987
- hospital management, mathematic model, nursing home, marker chain model, 1150

- image processing, image quality, radiography, resolving power, siemens star, artifacts, 316
- image quality, radiography, 939
- information processing, least square method, exponentials, 1372
- language, learning, different language, 3112
- linear system, transient response, differential equation, 138
- locomotion, locomotor system, muscle, 1668
- lymphatic system, lymphocyte recirculation, computer model, 1309
- magnetocardiography, 1988
- mathematic model, neuromuscular synapse, interspike interval sequence, 3193
- mathematic model, nerve conduction, ranvier node, 2847
- mechanoreceptor, nerve cell potential, nonlinear systems analysis, crayfish, 3195
- molecule, space filling, 401
- nerve cell network, nerve cell potential, 2837
- nerve cell potential, semicircular canal, pigeon, 2416
- nerve conduction, nerve potential, temperature, axon branch point, squid, 2474
- personality, research, review, 3111
- psychoanalysis, freud counterwill theory, 1632
- retina, retina horizontal nerve cell, spatial integration, 1291
- speech, speech synthesizer, markov model, 2447
- thyroid gland, thyroid hormone, assay, 1938
- 1651
- computer program**, acceleration, head, impact, intervertebral disk, neck, comprehensive, three dimensional head neck model, 2650
 - acceleration, eye, information processing, statistics, vestibular nystagmus, velocity, analog processing, cross correlation data analysis, 1497
 - acceleration, head, impact, mathematic model, muscle, neck, math modelling, volunteers, 1266
 - aircraft accident, computer model, injury, calspan gross motion simulation code, digital computer simulation, 2649
 - algorithm, laboratory automation, microprocessor, process control, 2692
 - anticoagulant agent, dose response, thrombosis, long term control, 1172
 - biochemistry, differentiation, digital computer, 3045
 - brain blood flow, cerebrovascular disease, computer, xenon 133, multiexponential curve fitting, 3482
 - cancer, drug half life, folinate calcium, kidney failure, mathematic model, methotrexate, pharmacokinetics, 5 patients, 3435
 - cancer growth, information processing, mathematic model, statistics, gompertz function, fortran, 2782
 - cancerogenesis, dose response, nuclear radiation, radiotherapy, value, 2331
 - cat, image processing, feature extraction, 3777
 - circadian rhythm, periodicities, time series, 848
 - compartment model, computer model, structural identification, 415
 - computer, monitoring, 2714
 - computer, emergency ward, information processing, model, statistics, deterministic simulation model, data reconstruction, 2686
 - computer, electrocardiography, telemetry, electric noise, artefact suppression, noise rejection, 2867
 - computer, heart index, heart output, thermodilution curve, on line computation, 850
 - computer assisted diagnosis, diagnosis, genetic polymorphism, parenthood, paternity, 3419
 - computer assisted tomography, modulation transfer function, scintillation camera, tomoscintigraphy, evaluation of depth effect, 2347
 - computer interface, digital computer, man machine interaction, speech, duvo, 3088
 - correlation function, statistics, usa, 1638
 - cytofluorimetry, cytophotometry, software, interactive scanning method, 3409
 - data base, information processing, medical record, pdp 12, 1610
 - diagnosis, fuzzy logic, observation, 2315
 - digital computer, display system, mathematic model, molecular structure, pdp 10, 420
 - digital computer, parallel computing, 990
 - digital computer, fault detection, 1794
 - digital computer, information processing, lateral geniculate body, minicomputer, probability, spike, statistics, cat, 1617
 - digital computer, medical record, fortran discharge summary, cobol ibm 370/158, 374
 - digital computer, man machine interaction, computer language, 3229
 - digital filtering, design, 2125
 - drug prescription, writing, writing assistance, 2296
 - drug protein binding, ligand, serum albumin, thyroxine, 1153
 - experimental animal, medical record, nonhuman primate, 2363
 - follow up, life table, population model, risk factor, survival rate, 1637

- fourier transform, fortran, 2405
- hearing, speech intelligibility, vowel, speech synthesis, 1030
- hospital management, medical record, public health service, mumps, 2747
- hospital management, medical record, public health service, mumps, 2746
- hospital management, information processing, medical record, public health service, mumps, u.s.a., 2745
- hospital service, information processing, medical record, capo program, canada, 1980
- industrial medicine, noise, sound level, cost computation, 2168
- information processing, probability, statistics, decomposition, algol, gaussian curve, 2404
- information processing, medical record, microprocessor, mumps, 3044
- information science, review, 3231
- jaw, photography, skeleton, medial axes, algol, 1973
- medical record, radiography, darr, automatic documentation, 1981
- medical record, retrieval system, mumps, 2366
- medical record, radiography, automatization, 376
- microprocessor, 1795
- motorized transport, statistics, stochastic model, traffic, vehicle degradation, safety inspection, 1630
- newborn surgery, parenteral feeding, 844
- parameter extraction, statistics, 688
- radiation dose, radium needle, radium therapy, 822
- computer teaching**, anemia, computer assisted diagnosis, hematology, model, computer vs non computer, france, 2690
- computer terminal**, medical record, user compatible terminal, 838
- conductance**, impedance, general radio 1615, modification, 2137
- conductivity**, air pollution, sulfur dioxide, hydrogen peroxide, temperature correction, 3680
 - aluminum oxide, radiography, 3202
 - cell fluid, micropipette, resistance, indirect measurement, 1809
 - electric accident, floor covering, gas discharge, medical instrumentation, safety, 2292
 - electrolyte, 3630
 - erythrocyte, mathematic model, erythrocyte size, 3556
 - nerve potential, nerve steady potential, nervous system, isolated nerve, frog, 479
- confinement**, body temperature, circadian rhythm, computer, heart rate, walking, sheep, 847
- congenital disease**, heart catheterization, philips acs, 2211
- congenital heart malformation**, b scan, echocardiography, echotomography, heart disease, high speed b mode echocardiography, 500 cases, 1435
- congenital hip dislocation**, arthrodesis, fracture external fixation, limb lengthening, pseudarthrosis, 48 patients, ilizarov apparatus, 3743
- congenital malformation**, amelia, arm prosthesis, powered prosthesis, arm absence, shoulder absence, case report, 707
 - brain malformation, brain tumor, computer assisted tomography, histogenesis, organogenesis, skull defect, computed tomography, indication, 1223
 - fetus heart rate, ultrasonics, mouse, 2573
- conization chamber**, image processing, multiwire chamber, roentgen radiation, 314
- connector plug**, fiberoscope, optical waveguide, 1400
- consciousness**, brain blood flow, brain cortex, frontal lobe, schizophrenia, xenon 133, review, 49 references, 1074
 - brain ventricle, cannulation, gonadotropin, growth hormone blood level, prolactin blood level, method, dual cannulation, awake rat, 671
- consonant**, hearing, speech, speech intelligibility, stop consonant, 453
 - hearing, information science, intelligibility, speech synthesizer, vowel, phoneme boundary effect, voice onset time, 57
 - intelligibility, speech, spanish, english, voice onset time, 2583
 - nasal speech, speech, linear predictive code, 902
 - speech, fricative consonants, japan, 2495
 - speech, time, 547
 - speech, voice onset time, 2582
- constant current stimulator**, cell membrane, electrostimulator, membrane potential, nervous system, current rectification, resistance measurement, 1491
- constipation**, anorectal pressure, anus, anus continence, rectum pressure, portable 3 channel unit, 210
- contact**, lipid membrane, membrane potential, contact force, 3555
- contact lens**, cornea curvature, keratoscopy, new device, 3344
- contamination**, laminar air flow, mouse, staphylococcus aureus, staphylococcus epidermidis, streptococcus, defined flora, husbandry, 3205
- continuous infusion**, cannulation, thoracic duct, mice, procedure, 1839
- contour**, beam profile, cobalt 60, gamma radiation, radiotherapy, central axis, 2273

- display system, photometry, 739
- contouring device**, computer, radiotherapy, roentgen dose distribution, computer compatible, 1917
- contraception**, computer, life table, 3040
- contrast**, darkness, light, mathematic model, retina image, visual system, human system, 1697
 - mathematic model, muller lyer illusion, perception, 2047
- contrast intensification**, angiography, wedge filter, 3024
 - brain, brain vascularization, computer assisted tomography, normal tomogram, 2000 scans, 796
 - brain blood flow, computer assisted tomography, xenon, baboon, 3461
 - brain infarction, brain tumor, computer assisted tomography, subtraction method, 19 cases, 2733
 - brain tomography, computer assisted tomography, resolving power, 2346
 - brain tumor, computer assisted tomography, diatrizoate, case series, 3079
- contrast medium**, abdominal radiography, computer assisted tomography, kidney cancer, case report, man of 79, 823
 - brain blood flow, computer assisted tomography, xenon, phantom study, monkey, 789
 - bronchography, computer assisted tomography, krypton, lung ventilation, xenon, phantom study, 790
- convection**, gas transport, lung diffusion, mathematic model, respiration, green function, 2050
- convulsion**, electroencephalography, sphenoid electrode, long term monitoring, 100 cases, apparatus, 668
- cooling**, amplifier, radioreceiver, signal noise ratio, 1762
 - blood pressure, finger, raynaud phenomenon, skin temperature, pressure measurement, human, 2208
 - brain cortex, peltier effect, thermode, local cooling, 2974
- cooling system**, heater, peltier effect, temperature control, dc proportional temperature controller, 2173
 - vacuum pump, monitoring, 994
- coordination**, computer model, leg movement, walking, insect, 1278
 - electromyography, joint, locomotion, mathematic model, movement, human, 432
- copper**, brain, brain cortex, electromagnetic radiation, hypothalamus, iron, magnesium, potassium, sodium, zinc, 1600 mhz, rat, 2564
 - prosthesis, thrombosis, antithrombogenic properties, artificial surface, 1245
- copper 65**, chlorine, nuclear magnetic resonance, element analysis, 2859
- core temperature**, body temperature, computer, telemetry, small animals, 2112
- corn**, environment, germination, microwave radiation, 2152
- cornea**, c potential, electrode, electroretinography, retina, sclera, rabbit, 557
 - early receptor potential, electrocardiography, electrode, wick electrode, bright flash ecg, 2998
- cornea curvature**, astigmatism, cataract extraction, cornea transplantation, keratometer, microsurgery, troutman type, 1517
 - contact lens, keratoscopy, new device, 3344
- cornea endothelium**, microscopy, 2631
- cornea epithelium**, artificial tear, ocusert, tear, tear film, 2991
- cornea reflex**, eye movement, head movement, tilting, eye rotation, torsional movement, human, 446
- cornea thickness**, measurement, evaluation of an electronic meter, 16 subjects, 2240
- cornea transplantation**, aphakia, intraocular pressure, mathematic model, trabecular meshwork, 2800
 - astigmatism, cataract extraction, cornea curvature, keratometer, microsurgery, troutman type, 1517
- coronary artery**, artery flow, atherosclerosis, coronary artery blood flow, mathematic model, pulsatile flow, rheology, flow analysis, 2454
 - doppler ultrasound flow meter, heart surgery, ultrasonics, localization of coronary artery, 3689
 - heart infarction, radiocontrolled occluder, occluder, 1467
- coronary artery blood flow**, adenosine, adenosine triphosphate, adenylcyclase, computer model, cyclic amp, heart muscle ischemia, hypoxanthine, inosine, noradrenalin, rat, 872
 - artery flow, atherosclerosis, coronary artery, mathematic model, pulsatile flow, rheology, flow analysis, 2454
 - coronary artery circulation, heart muscle oxygen tension, mathematic model, coronary bed on inhomogeneity, rat, 3701
 - doppler ultrasound flow meter, echocardiography, noninvasive measurement, 1020
- coronary artery circulation**, coronary artery blood flow, heart muscle oxygen tension, mathematic model, coronary bed on inhomogeneity, rat, 3701
 - model, intramyocardial blood flow, 3168
- coronary care unit**, assisted circulation, electrocardiography, fluoroscopy, hemodynamics, monitoring, 3353 patients, 30 bed coronary care unit, 217
 - computer, electrocardiography, heart arrhythmia, heart infarction, heart ventricle arrhythmia, 2293
 - digital computer, electrocardiography, monitoring, 771
 - electric accident, emergency ward, hospital, intensive care, labor room, operating room, recovery room, safety, maryland lutheran hospital, 502
 - electrocardiography, thorax electric field, precordial ecg mapping, 3693
 - heart arrhythmia, monitoring, nurse, decentralized electrocardiographic display, 2290
 - 2589

corona virus, cellular immunity, immune deficiency, mononuclear granulocyte, mouse hepatitis virus, spleen cell transplantation, thymectomy, T lymphocyte, virus infection, 3402

corpus callosum tumor, astrocytoma, computer assisted tomography, evoked visual response, occipital cortex, optic radiation, 51 yr old man, necropsy, histopathology, 3724

correlation function, air pollution, digital computer, spectrometry, 1872

- aldosterone, corticosterone, hydrocortisone, plasma renin activity, 1654
- algorithm, 878
- algorithm, factorial analysis, parameter, matrix analysis, 3511
- analog computer, spectrometry, 2517
- binaural hearing, hearing, 2984
- cochlea, coding, hearing, mathematic model, signal processing, reverse correlation technique, 3154
- computer program, statistics, usa, 1638
- drug dependence, family psychiatry, heroin, statistics, 3494
- echography, laser, light reflection, ultrasonics, 127
- electroencephalography, evoked response, information processing, 1948
- electroencephalography, spectrometry, 349
- electromyography, larynx, speech, volunteer, 3217
- holography, pattern recognition, optical correlation, 1784
- information processing, nonlinear system, wiener analysis, 1737
- speech, vocal pitch, autocorrelation, 901
- statistics, kendall rank test, 2021
- reference correlator, 544

corrosion, brain depth stimulation, electrostimulation, needle electrode, nervous system, biphasic stimulation, 2228

cortical bone, biomechanics, bone, orthopedic surgery, bone pin connection, 3136

- bone piezoelectric potential, ceramics, dielectric constant, silicon dioxide, titanin acid, ultrasonics, human, 75
- collagen, mathematic model, osteon, piezoelectricity, stress frequency, 80

corticosterone, aldosterone, correlation function, hydrocortisone, plasma renin activity, 1654

corticotropin, adrenal gland, chemical kinetics, model, 2183

cosmic radiation, attitude, aviation, neutron radiation, mid altitude flight, 3675

cosmonaut, behavior, communication, medical assessment, space flight, space time dialogue, 295

cost, accident, law, rescue personnel, equipment, organization, minden gfr, 2575

- anesthesia, heart arrest, lung function, medical record, monitoring, operating room, techniques, requirement, 3032
- clinical laboratory, computer, hospital, 3405
- computer, electrocardiography, task force, 2702
- computer, electrocardiography, monitoring, physician, safety, over and underutilization, contribution to diagnosis, task force, 2701
- decision, diagnosis, differential diagnosis, ischemic heart disease, mathematic model, mathematics, prognosis, statistics, expected outcome loss, 759
- epidemiology, immunization, mathematic model, model, statistics, 3509
- epidemiology, immunization, mathematic model, 3508
- hospital engineering, medical engineering, medical instrumentation, 300 bed, 500 bed hospital, 11 cleveland hospitals, 1241

cost benefit analysis, accident, automobile industry, car driving, risk factor, safety, usa, 1529

- ambulatory care, computer, information processing, medical record, combined with manual techniques, indianapolis, 1609
- computer assisted tomography, diagnosis, epilepsy, headache, temporal lobe epilepsy, 107 cases, u.s.a., 1209

cost effectiveness, bioengineering, hospital, medical instrumentation, 450 beds hospital, 1621

- brain, computer assisted tomography, 3077 scans, 3825

coughing, automated counting, data, 57 patients, 3311

coulter counter, alarm monitoring, audible reject alarm, counter s, 625

- thrombocyte count, special technique, whole blood, 3279

counter, amplifier, counting, preamplifier, 955

- leukocyte, pattern recognition, television, hematrak differential counter, 628
- light scattering, spermatozoon, spermatozoon motility, 1368
- nerve cell potential, spike, event counter, 1355

countercurrent multiplier system, blood oxygen tension, gas, mathematic model, oxygen electrode, swimming device, experimental model verification, eel, 914

- computer, kidney function, mathematic model, 2457
- computer model, kidney tubule absorption, mathematic model, sodium, urea, transient simulation, steady state simulation, 473

- computer model, gas exchange, mathematic model, swimming device, 913
- counting**, amplifier, counter, preamplifier, 955
 - computer, pharmacy, tablet, bar code recorder, 1984
- covariance**, computer model, statistics, ratio use, 3122
- c potential**, cornea, electrode, electroretinography, retina, sclera, rabbit, 557
- cranial nerve**, electrode, electrostimulator, nerve stimulation, pons angle, apparatus, 678
- craniopharyngioma**, astrocytoma, brain tumor, central nervous system metastasis,
 - computer assisted tomography, hypophysis adenoma, meningioma, 1658 cases, 817
 - computer assisted tomography, 5 year old girl, 1184
 - computer assisted tomography, exophthalmos, hemianopia, orbit, subarachnoid cyst, boy of 7, 2738
- creatine kinase**, enzyme demonstration, polyacrylamide gel, device, 2862
- creatinine blood level**, compartment model, hemodialysis, mathematic model, peritoneal dialysis,
 - urea blood level, uremia, 3169
- cremation**, artificial heart pacemaker, battery, explosion, nuclear energy, mercury zinc batteries, lithium batteries, nuclear powered pacemakers, danger of explosion, britain, 2930
- creutzfeldt jakob disease**, computer assisted tomography, encephalopathy, slow virus disease, 2 cases, 1603
- critical band width**, auditory masking, hearing, rippled noise masker, 1680
- critical flicker fusion**, photostimulation, vision, sinusoidal stimulator, 1105
- cross correlation**, bone marrow cell, cell, microscopy, multispectral cell image, 2307
- crossing over**, deoxyribonucleic acid, deoxyribonucleic acid strand, mathematic model, optic chiasm, four strand model, interference, 2787
- cryogenics**, amplifier, fet semiconductor, microwave radiation, signal noise ratio, 107
 - amplifier, nuclear magnetic resonance, signal noise ratio, 2153
 - amplifier, charge amplifier, 952
 - dentistry, mouth surgery, orthopedic surgery, instrument, 328
 - electron spin resonance, spectrometry, 3.7 k, 181
 - generator, nuclear magnetic resonance, stability, 182
 - microscopy, sample holder, 2507
 - microwave radiation, paramagnetic resonance, microwave coupler, 186
 - neutron radiation, nuclear radiation, spectrometry, 1014
 - nuclear magnetic resonance, 2568
- cryostate**, enzyme, photometry, spectrometry, 2506
 - infrared radiation, bolometry, infrared detector, 2901
 - thermostat, flow cryostat, 3616
- crystal**, bone, electron spin resonance, radiation injury, random orientation, 187
 - life, memory, definition, crystalline physiology, 2969
 - magnesium, thermocouple, ionic thermocurrent measurement, 162
 - piezoelectricity, powder, demonstration device, 161
- cuff**, blood pressure, automation, 2602
 - endotracheal intubation, trachea injury, tracheotomy tube, comparison of 5 types, dog, 3310
- cuprophane**, artificial kidney, cellophane, cellulose membrane, hemodialysis, hemodialysis membrane, ion exchange, 1875
- cupula**, mathematic model, otolith, semicircular canal, sensation interaction, 436
- current amplifier**, amplifier, operational amplifier, impedance converter, 1352
- current density**, artificial heart pacemaker, electrode impedance, electrode surface geometry, current consumption, 2197
- current meter**, amplifier, 517
 - contactless method, 160
- curve fitting**, compartment model, information processing, numerical method, 2762
 - information processing, 3128
- curve tracer**, graphology, pattern recognition, 2023
- cuvette**, hemoglobin, oximetry, photometry, wedge cuvette, 2141
- cybernetics**, feedback system, memory, philosophy, 2007
 - information science, mathematic model, perception, 419
- cyclic amp**, adenosine, adenosine triphosphate, adenylcyclase, computer model, coronary artery blood flow, heart muscle ischemia, hypoxanthine, inosine, noradrenalin, rat, 872
 - adenylcyclase, computer model, heart muscle ischemia, hypoxanthine, inosine, noradrenalin, phosphodiesterase, vasodilatation, rat, 2452
- cyclohexane**, erythroslis, fluorescence, gamma counting, 1402
- cycloheximide**, adenosine triphosphatase, amnesia, lithium chloride, memory, ouabain, phenytoin, potassium chloride, protein synthesis, sodium pump, 3 phase model, 241
- cyclotron**, cell culture, fast neutron radiation, fibroblast, hemopoietic cell, leukemia cell, gamma radiation, relative biologic effectiveness, radiologic calibration program, hamster, human fibroblast, mouse, guinea pig, 2094

- fast neutron radiation, radiation dose, physical characteristics, 2093
- cystadenoma**, computer assisted tomography, pancreas tumor, case report, 3464
- cystic bile duct**, catheter, cholangiography, peroperative cholangiography, cystic duct catheter clamp, 1035
- cystoscopy**, carbon dioxide laser, instrument, experiment, rabbit, 3719
- cytochrome**, chlorophyll, electron transport, infrared radiation, spectrometry, electron tunneling, 180
- cytofluorimetry**, computer program, cytophotometry, software, interactive scanning method, 3409
- cytology**, cancer cytodiagnosis, computer, data base, simple system, histologic control, 1936
 - cell, fourier transform, image processing, uterine cervix cytology, 2511
 - cell, mathematic model, pattern recognition, uterine cervix cytology, 2509
 - deoxyribonucleic acid, laser, spectrometry, uterine cervix cytology, 2510
 - fourier transform, image processing, pattern recognition, microscopy, 3596
- cytometry**, cell, fluorescein derivative, device, 1346
- cytophotometer**, digital computer, microprocessor, system controller, 2508
- cytophotometry**, computer program, cytofluorimetry, software, interactive scanning method, 3409
 - retina, retina bipolar ganglion cell, ribonucleic acid, stroboscopy, target movement, histochemistry, frog, 2632
- cytoplasm**, adenosine triphosphate, colchicine, protoplasm streaming, nitella flexilis, 1626
- cytotoxicity**, acetal, biocompatibility, cell culture, nylon, plastic, polyethylene, polystyrene, polyurethan, silastic, teflon, testing, 866
- dacron**, aortofemoral bypass graft, catheter, celiac trunk angiography, percutaneous selective angiography, case report, 3382
- dactyloscopy**, fingerprint, photography, mirror fingerprint, new method, 2861
- dark adaptation**, adaptometry, night vision, new device, 3342
 - light adaptation, photoreceptor, ventral photoreceptor, limulus, 3735
- darkness**, contrast, light, mathematic model, retina image, visual system, human system, 1697
- data analysis**, averaging, cardiovascular system, 3295
- data base**, acute lymphoblastic leukemia, B lymphocyte, computer, T lymphocyte, clinfo, 2365
 - angiocardiology, artificial heart pacemaker, decision, minicomputer, 3095
 - arteritis, atherosclerosis, computer, leg, 839
 - autopsy, cancerogenesis, cancer research, computer, mouse strain, organ, pathology, national center for toxicological research, usa, automated pathology information system, 1158
 - breast biopsy, computer, diagnosis, mammography, pathology, radiography, interclinical cross check, 708 cases, austria, 3430
 - cancer cytodiagnosis, computer, cytology, simple system, histologic control, 1936
 - cardiology, histopathology, information processing, pathology, respiration, ssis, 3087
 - computer, education, gingiva, oral biopsy, tooth care, oral biopsy data, 8 dental schools, usa, 3471
 - computer, protein, 2689
 - computer, stereotaxic surgery, thalamus, automatic thalamus mapping, 130 cases, 856
 - computer assisted diagnosis, dyspepsia, stomach cancer, 762
 - computer program, information processing, medical record, pdp 12, 1610
 - documentation, hospital service, information processing, literature, public health service, network, heclines system, gfr, 1228
 - electrocardiography, task force, 2916
 - epidemiology, 3041
 - gastroenterology, information processing, medical record, 1611
 - information processing, medical documentation, medical record, gfr, 3467
 - information processing, medical documentation, model, postgraduate education, retrieval system, medlars medline, index medicus, usa, problem oriented medical data, 2751
 - information processing, structuring method, 2878
 - information processing, medical record, sari, 372
 - information system, mass utility multi programming system, 2682
 - literature, medlars, retrieval system, request analysis, medline, 1607
 - macromolecule, protein binding, file for macromolecular structures, crystallographic studies induced, atomic coordinates, partial bond connectivities, how to use it, 1147
 - medical documentation, medical literature, retrieval system, query system, 3468
 - medical record, model, retrieval system, indexing, 1608
 - medical record, data protection, 1225
- data reduction**, coding, image processing, 15
 - data transmission, electrocardiography, telemetry, vectorcardiography, 1773
 - data transmission, electrocardiography, information processing, microprocessor, telemetry, 1944
 - information processing, statistics, 2022
- data transmission**, data reduction, electrocardiography, telemetry, vectorcardiography, 1773

- data reduction, electrocardiography, information processing, microprocessor, telemetry, 1944
- fourier transform, image processing, projection, 979
- image processing, signal noise ratio, telephone telemetry, television, 1930
- image processing, telemetry, wave guide, 3218
- signal, telemetry, d.c directional coupler, 961
- telemetry, review, 963
- deafness**, age, hearing, age dependence, 53
 - auditory training, hearing aid, 2980
 - blindness, display system, electrostimulator, touch, 2981
 - cochlea, electrode, hearing aid, implantation, prosthesis, multiple electrode system, 3341
 - hearing, speech, dichotomic hearing, speech compression, 2817
 - hearing, intelligibility, masking, signal noise ratio, 657
 - hearing, speech, touch, 3352
 - hearing, hearing aid, speech, speech coding, 1513
 - hearing aid, no mold fitting, 1098
 - hearing aid, perception deafness, gain, frequency response, 1090
 - hearing aid, intelligibility, noise, signal noise ratio, speech discrimination, 34 patients, peak clipping, automatic pain control, 2628
 - speech, touch, 2629
- deceleration**, acceleration, blunt trauma, traffic accident, trauma, velocity, tolerance to impact acceleration, 2803
- decerebration**, nerve cell potential, recurrent inhibition, rensaw cell, dynamic properties, extracellular recording, cat, 1735
- decision**, algorithm, computer assisted diagnosis, decision theory, diagnosis, 336
 - angiocardiology, artificial heart pacemaker, data base, minicomputer, 3095
 - background radiation, dosimetry, model, radioactivity, statistics, statistical interpretation of counting data, 306
 - behavior, mathematic model, motivation, nerve cell network, statistics, stimulus, behavioral mode selection, 399
 - blood bank, frozen blood, utilization, 1838
 - cancer chemotherapy, computer, methotrexate, 100 patients, 3053
 - computer, learning, medical education, u.k., 1557
 - cost, diagnosis, differential diagnosis, ischemic heart disease, mathematic model, mathematics, prognosis, statistics, expected outcome loss, 759
 - decision theory, information science, review, 1260
 - information processing, noise, signal detection, vision, multiple channel, human, 1694
 - mathematic model, model, survey, model testing, 2765
 - pattern recognition, reading aid, statistics, character recognition, 531
 - fuzzy variable, 418
- decision theory**, algorithm, computer assisted diagnosis, decision, diagnosis, 336
 - angiography, blood vessel injury, brain, 1222
 - clinical chemistry, multi flipflop, 2020
 - decision, information science, review, 1260
 - diagnosis, mathematic model, meningitis, 248
 - diagnosis, mathematic model, neurology, 338
 - diagnosis, mathematic model, multivariate analysis, symptoms, 337
 - signal detection, statistics, 3119
 - task performance, fault diagnosis, 3504
- decompression**, doppler ultrasound flow meter, spectrometry, ultrasonics, decompression data, 1022
- decompression sickness**, gas bubble, mathematic model, gas cavitation nuclei, 463
- defibrillation**, direct current, electrode, paddle electrode size, 1845
 - electric shock, half cycle sinusoid, dog, 1860
 - electrode, electrode paste, impedance, model, interface material testing, 3698
 - electrode, electrode paste, skin, thorax impedance, paddle electrode paste, comparison, 2190
 - heart ventricle fibrillation, electrical dose, 100 patients, 2944
 - mathematic model, model, skin burn, skin conductance, defibrillator default, human, 450
 - strength duration curve, transtest defibrillation, trapezoidal waveform, ponies, dog, 3697
 - thorax impedance, human, measurement, 3712
 - improvement, dose, ems equipment, 2604
- delayed hypersensitivity**, antibiotic agent, antibody production, antigen antibody reaction, immune response, mathematic model, 3114
- delivery**, computer, fetus, fetus heart rate, labor, pregnancy, 1571
 - labor, pregnancy, continuous posub 2 monitoring, transcutaneously, electrode, 564
 - labor, partogram, electronic apparatus, 3314
 - labor, partogram, 3313

- delta rhythm**, alpha rhythm, beta rhythm, computer, electroencephalography, theta rhythm, 306 subjects, normal value, computer analysis, 2705
 - alpha rhythm, artifact, automation, drowsiness, electroencephalography, theta rhythm, 31 subjects, artifact rejection, 1947
- dementia**, alcoholism, alzheimer disease, brain atrophy, computer assisted tomography, multiple sclerosis, parkinson disease, progressive multifocal leukoencephalopathy, schilder disease, survey, 358
 - brain, computer assisted tomography, diagnosis, overreliance, 1964
- demyelination**, brain white matter, computer assisted tomography, multiple sclerosis, optic nerve, 100 cases diagnosis, 3829
- dendrite**, nerve fiber membrane steady potential, nonlinear electrotonus, 3546
- denervation**, electromyography, motoneuron disease, neuropathy, automatic analysis, 1955
- densitometry**, aorta flow, 3696
 - atherosclerosis, cholesterol, computer, femoral angiography, cadaver angiograms, 1599
 - compton effect, photon scanning, tissue densitometry, 3383
 - computer assisted tomography, gamma radiation, radiation scattering, roentgen radiation, compton scatter, 810
 - computer assisted tomography, liver, whole body tomography, 120 cases, 1564
 - heart, lung cancer, lung cyst, lung emphysema, mediastinum, thorax wall, 33 thoracic tomodensitometers 1061
 - image processing, minicomputer, television, 124
 - lung congestion, lung density, lung edema, radiation, gamma radiation, samarium 153, 1332
 - microdensitometry, modulation transfer function, temporal response, 3023
- density**, brain abscess, computer assisted tomography, encephalopathy, glioblastoma, measurement of mean density, 798
- dentistry**, artificial heart pacemaker, electric accident, guidelines, 2927
 - cryogenics, mouth surgery, orthopedic surgery, instrument, 328
 - immobilization, restraining device, sling, dog, 2914
 - orthodontics, force measurement, 2919
 - roentgen apparatus, roentgen tube, 3780
- deoxyguanosine phosphate**, computer, erythrocyte sedimentation rate, free radical, gamma radiation, computer analysis of esr spectrum, 2343
- deoxyribonucleic acid**, cancer chemotherapy, cell cycle, drug dose, drug resistance, system analysis, model, mouse, 783
 - colloid, electric field, fluorescence, macromolecule, induced fluorescence, 1831
 - computer, sequence analysis, computer, 3048
 - crossing over, deoxyribonucleic acid strand, mathematic model, optic chiasm, four strand model, interference, 2787
 - cytology, laser, spectrometry, uterine cervix cytology, 2510
 - electron transport, fast electron radiation, ice, 3204
 - supercoiling, elastic model, 874
- deoxyribonucleic acid strand**, crossing over, deoxyribonucleic acid, mathematic model, optic chiasm, four strand model, interference, 2787
- deprivation**, mathematic model, skin, finite deformation theory, 2035
- depth perception**, binocular vision, computer model, scheme, 691
 - laser, pupil, vision, 3539
- dermatoglyphics**, finger printing stand, 3568
- desmosome**, mathematic model, nerve cell, nerve fiber, nerve resistance, septum resistance, nexuses, earthworm, 997
- deuteron radiation**, beryllium, dosimetry, fast neutron radiation, fast proton radiation, neutron generator, characterization of neutron beam, 2662
 - fast neutron radiation, fast particle radiation, fast proton radiation, lithium, neutron radiation, 3254
- device**, extracorporeal circulation, pump, pulsatile pump system device, dog, 1469
- diabetes mellitus**, atherosclerosis, capillary flow, hypertension, microscopy, skin capillary, television, vital television capillary microscopy, 3285
- diagnosis**, algorithm, computer assisted diagnosis, decision, decision theory, 336
 - breast, information processing, thermography, 1940
 - breast biopsy, computer, data base, mammography, pathology, radiography, interclinical cross check, 708 cases, austria, 3430
 - cancer, cancer chemotherapy, mathematic model, radiotherapy, statistics, therapy evaluation, 2361
 - classification, coding, index, medical record, pathology, german, 341
 - coding, computer, computer assisted diagnosis, automatic diagnosis coding, 2313
 - computer, documentation, epidemic, pharmacotherapy, 2329
 - computer, computer assisted diagnosis, schizophrenia, computer vs clinician, 760
 - computer, lung, radiography, thorax radiography, 2316

- computer, history, u.k., 2312
- computer assisted diagnosis, computer program, genetic polymorphism, parenthood, paternity, 3419
- computer assisted diagnosis, differential diagnosis, meningitis, statistical diagnosis, clinical diagnosis, 1565
- computer assisted tomography, cost benefit analysis, epilepsy, headache, temporal lobe epilepsy, 107 cases, u.s.a., 1209
- computer program, fuzzy logic, observation, 2315
- cost, decision, differential diagnosis, ischemic heart disease, mathematic model, mathematics, prognosis, statistics, expected outcome loss, 759
- decision theory, mathematic model, meningitis, 248
- decision theory, mathematic model, neurology, 338
- decision theory, mathematic model, multivariate analysis, symptoms, 337
- digital computer, electrocardiography, 1943
- electromyography, gait, locomotion, pattern recognition, 19 patients, 1906
- lung edema, microwave radiation, 656
- medical documentation, thesaurus, 3404
- medical record, thesaurus, german thesaurus, compatibility, 1612
- sampling, statistics, expert estimate, 24
- dialysis membrane**, artificial kidney, erythrocyte, leukocyte, thrombocyte, blood component deposited, electron microscopy, 621
 - artificial kidney, hemodialysis, progress in 20 years, 3720
- diaphragm**, artificial heart pacemaker, electromyography, bipolar demand pacemaker, inhibition by diaphragmatic myopotentials, 2195
 - breathing muscle, computer, digital computer, lung, lung volume, rabbit, 1994
 - functional residual capacity, lung function, pneumography, 2952
 - mathematic model, muscle fiber membrane potential, neuromuscular system, rat, 1315
 - oxygen consumption, polarography, high sensitivity device, rat, 1832
- diaphragm crus**, computer assisted tomography, 100 cases, 3815
- diaphragm hernia**, computer assisted tomography, mediastinum mass, mediastinum tumor, omentum, omentum hernia, case report, 1207
- diarrhea**, epidemic, mathematic model, pattern recognition, 139 infants, 2781
- diathermy**, electromagnetic field, electromagnetic radiation, hyperthermia, microwave radiation, physiotherapy, 2178
 - electromagnetic radiation, physiotherapy, radiation absorption, penetration depth, 1909
 - skin burn, thermometry, diathermic microthermometry, 3745
- diatrizoate**, brain tomography, computer assisted tomography, case series, 791
 - brain tumor, computer assisted tomography, glioma, hypophysis adenoma, meningioma, non contrast scanning, 299 cases, 3457
 - brain tumor, computer assisted tomography, contrast intensification, case series, 3079
 - computer assisted tomography, thyroid gland, 1591
- dielectric constant**, biopolymer, 2889
 - bone piezoelectric potential, ceramics, cortical bone, silicon dioxide, titanin acid, ultrasonics, human, 75
 - cell, cell interaction, cell potential, model, 485
 - electric field, electromagnetic radiation, muscle, 2851
 - electromagnetic radiation, microwave radiation, 1810
 - lipid membrane, membrane, theoretical calculation, bilayer membrane, 91
 - microwave radiation, dielectric lens, 585
 - microwave radiation, muscle, tissue water, rotational water mobility, 184
 - polymer, .4-2 kHz, 3631
- differential amplifier**, analog computer, 3604
 - cell membrane potential, epithelium, signal noise ratio, 2886
 - electrometer, ph measurement, 511
 - integrated circuit, medical instrumentation, 951
- differential diagnosis**, computer, display system, hand, information processing, parkinsonism, tremor, 1240
 - computer assisted diagnosis, diagnosis, meningitis, statistical diagnosis, clinical diagnosis, 1565
 - cost, decision, diagnosis, ischemic heart disease, mathematic model, mathematics, prognosis, statistics, expected outcome loss, 759
- differentiation**, analog computer, low frequency differentiator, 2120
 - biochemistry, computer program, digital computer, 3045
 - analog inverting, 1371
- diffractometer**, light diffraction, muscle, muscle contraction, muscle length, photodiode, sarcomere, sarcomere length determination, 3362
- diffusion**, atherosclerosis, diffusion equation, convective diffusion, bifurcation, 1300
 - cell membrane, cell membrane permeability, fluidics, mathematic model, 2431
 - cell membrane, diffusion coefficient measurement, 1249

- cesium 137, epidermis, skin permeability, strontium 89, role, 292
- chemical kinetics, computer model, pattern recognition, activator inhibitor, 2397
- computer model, nonlinear system, population model, 1257
- ecology, equation, migration, nonlinear system, population model, differential equation, multispecies model, stability, 876
- electron microscopy, scanning electron microscopy, heavy atoms, 982
- heat conduction, nonlinear system, thermodynamics, diffusion equation, 1280
- hemoglobin, myoglobin, oxygen, facilitated diffusion, 466
- population model, lotka volterra model, oscillating system, 875
- digital analog converter**, cardiometer, heart rate, period meter, 1847
 - computer, storage oscilloscope, signal averager, data acquisition, 1786
- digital computer**, ad converter, computer interface, image processing, scintigraphy, scintillation camera, 3014
 - air pollution, fluorescence, multichannel analyzer, roentgen radiation, serum, 3277
 - air pollution, correlation function, spectrometry, 1872
 - algorithm, medical record, outpatients, 3084
 - algorithm, heart output, stewart hamilton method, 2064
 - analog computer, heart catheterization, hemodynamics, information processing, mini computer, 1990
 - antibiotic agent, bacteriology, autobac, ms2, abac, 3799
 - arm prosthesis, blood pressure, electroencephalography, heart catheterization, microprocessor, monitoring, prosthesis, 2685
 - audiometry, 2260
 - averaging, digital filtering, electroencephalography, evoked response, evoked visual response, model, 3727
 - averaging, electrocardiography, monitoring, vectorcardiography, 344
 - biochemistry, computer program, differentiation, 3045
 - blood flow, doppler ultrasound flow meter, information processing, ultrasonics, 2755
 - breathing muscle, computer, diaphragm, lung, lung volume, rabbit, 1994
 - circadian rhythm, fourier transform, information processing, progressive analysis, 2391
 - clinical chemistry, enzyme kinetics, photometry, spectrometry, zeiss prp, 753
 - computer, fluorimeter, gamma counting, spectrometry, 1404
 - computer, eye movement, signal processing, one line analysis, human, 1229
 - computer, image processing, information processing, scintigraphy, 1576
 - computer, electrocardiography, exercise, thorax electric field, precordial isopotential map, 1235
 - computer interface, computer program, man machine interaction, speech, duvo, 3088
 - computer interface, medical record, speech synthesizer, telephone enquiry, 3086
 - computer interface, history, information processing, voice response system, 1160
 - computer interface, speech, speech pitch measurement, 64
 - computer memory, digital recording, information processing, strip chart recorder, address indicator, 991
 - computer memory, development, 542
 - computer model, diuresis, kidney tubule absorption, sodium, sodium depletion, water, 478
 - computer model, motivation, sexual behavior, male rat, 2393
 - computer model, electric field, steady potential, 82
 - computer model, parallel array, 2121
 - computer model, man machine interaction, 2525
 - computer model, glucose tolerance test, insulin, plasma, proinsulin, 18 patients, 2767
 - computer program, display system, mathematic model, molecular structure, pdp 10, 420
 - computer program, parallel computing, 990
 - computer program, fault detection, 1794
 - computer program, information processing, lateral geniculate body, minicomputer, probability, spike, statistics, cat, 1617
 - computer program, medical record, fortran discharge summary, cobol ibm 370/158, 374
 - computer program, man machine interaction, computer language, 3229
 - coronary care unit, electrocardiography, monitoring, 771
 - cytophotometer, microprocessor, system controller, 2508
 - diagnosis, electrocardiography, 1943
 - digital recording, tape recorder, code, 1767
 - display system, electron microscopy, image processing, 3 d display, 2498
 - display system, holography, stereoscopy, 545
 - display system, man machine interaction, task performance, 540
 - documentation, literature, university London, 3849
 - echography, image processing, nuclear magnetic resonance, radiography, reprography, thermography, 3459
 - electrocardiography, medical record, simplified record, 1227
 - electrocardiography, information processing, rs t complex, 346
 - electrocardiography, heart ventricle systole, his bundle potential, 1942
 - electroencephalography, fourier transform, spectrometry, 3806

- electroencephalography, pattern recognition, adaptive segmentation, 1952
- electroencephalography, 1167
- fourier transform, hardware, 1261
- gas exchange, information processing, spirometry, 2756
- hearing aid, hearing aid test, 3411
- image processing, minicomputer, image restoration, one line computation, 1369
- image processing, microprocessor, array processor, 1793
- image processing, photometry, stereoscopic vision, vision, 3647
- information processing, pattern recognition, speech, speech frequency, 63
- lateral geniculate body, nerve cell network, vision, visual system, cat, 2380
- light diffraction, muscle fiber, refraction index, sarcomere, ccd, 177
- literature, medical record, retrieval system, review, 836
- lung volume, plethysmography, online measurement, 858
- magnetic field, susceptibility, 2542
- man machine interaction, task performance, 1792
- man machine interaction, task performance, 541
- medical education, plato, 329
- medical engineering, microprocessor, instrumentation, application, 2483
- medical record, lexicon, 2748
- microcomputer, microprocessor, applicability, 1791
- microprocessor, basic principle, 989
- microprocessor, process control, 988
- microprocessor, 140
- microprocessor, multi-microprocessor system, 2521
- microprocessor, multi microprocessor system, 2520
- microprocessor, architecture, 2124
- microprocessor, evaluation, 2123
- microprocessor, small scale system, 2522
- minicomputer, one board computer, 142
- minicomputer, process control, 2122
- minicomputer, oscilloscope, signal processing, 3228
- nuclear magnetic resonance, process control, spectrometry, 2531
- pattern recognition, line figure, 2527
- pattern recognition, vision, 2449
- pharmacokinetics, multiple iteration program, 3476
- ph measurement, process control, errors, 3241
- potentiometer, hybrid computer, digital potentiometer, 3572
- sampling, signal processing, 135
- spectrometry, ultraviolet radiation, electron emission, 1559
- speech, speech intelligibility, speech understanding system, 3230
- speech, signal handling, 1866
- user profile, 2518
- application, micro computer, 139
- digital display**, display system, radiation exposure, victoreen model 555, nodule, 297
- digital filtering**, algorithm, fourier transform, fast fourier transform, 2529
 - algorithm, filter synthesis, 543
 - analog digital converter, computer memory, read only memory, 1373
 - averaging, digital computer, electroencephalography, evoked response, evoked visual response, model, 3727
 - averaging, electroencephalography, application, 2516
 - band pass filter, design, 137
 - brain, heart infarction, image processing, scintigraphy, scintillation camera, thermography, 1929
 - computer, signal processing, online digital filter, 2118
 - computer assisted tomography, image processing, scintigraphy, e filter, 2 dimensional filter, 825
 - computer program, design, 2125
 - evoked response, fourier transform, mathematic model, 1750
 - information processing, polyphase network, 987
 - information processing, recursive filtering, 986
 - information processing, fir filter, multirate filtering, 2528
 - signal processing, statistics, 3574
 - linear phase, 3609
 - design, 3611
- digital indicator**, monitoring, newborn, vibration, rat, 1551
- digital recording**, computer memory, digital computer, information processing, strip chart recorder, address indicator, 991

- digital computer, tape recorder, code, 1767
- digital system**, anesthesia, artificial ventilation, ventilator, digital control, 1547
- dihydralazine**, artery pulse rate, blood pressure, rat, apparatus, 2185
- dilatometry**, displacement indicator, fiberoscope, interferometry, laser, 1405
- dimercaptosuccinate technetium tc 99m**, computer, kidney cancer, kidney cyst, kidney scintiscanning, a comparing study, 2718
- diode**, display system, light, voltmeter, led array, 956
 - mixing, receiver, signal noise ratio, telemetry, 119
 - nuclear magnetic resonance, semiconductor, calibration, 1010
- dipole theory**, excitable membrane, gating circuit, ion channel, 3178
 - mathematic model, nerve fiber potential, 3175
- direct current**, defibrillation, electrode, paddle electrode size, 1845
- direct current amplifier**, chopper amplifier, superconduction, 953
- direct current converter**, bioelectronics, bioenergy, power supply, solar cell, telemetry, 3214
- directional hearing**, binaural hearing, echolocation, mathematic model, 3155
 - binaural hearing, hearing, minimum auditory movement angle, 3345
 - binaural hearing, hearing, auditory time discrimination, 52
 - binaural hearing, hearing, auditory lateralization, complex waveform, 1089
 - binaural hearing, hearing, moving source, dichotic stimulation, 4 volunteers, 1284
 - hearing, industrial medicine, sound detection, 265
 - hearing, median sagittal plane, 1510
 - sound, microphone, microphone array, bone, 3532
- disabled**, artificial skin, back, hand prosthesis, skin, touch, 1908
 - blindness, prosthesis, volume measurement, filling cup, 2258
 - communication, prosthesis, transducer, morse decoding system, 1117
 - electromyography, information processing, prosthesis, signal processing, 1744
- disaster**, monitoring, stethoscope, trauma, war, 1141
- discriminatory analysis**, electroencephalography, kidney failure, 3333
- disease carrier**, epidemic, mathematic model, threshold theorem, 2779
- disease classification**, automation, index, medical record, pathology, snop vs icd, 2744
- dispenser**, behavior, fluid, multiple liquid dispenser, catfish, 2970
- displacement**, cell growth, cell motion, mathematic model, 1646
 - interferometry, laser, vibration, vibration measurement, displacement measurement, speckle interferometer, 1432
- displacement indicator**, dilatometry, fiberoscope, interferometry, laser, 1405
- displacement transducer**, cell membrane, transducer, 509
 - theory, inductive transducer, 3626
- display system**, blindness, deafness, electrostimulator, touch, 2981
 - collimator, fast electron therapy, linear accelerator, megavoltage radiotherapy, collimator positioning device, 2659
 - computer, nerve cell, ultrastructure construction, 2071
 - computer, differential diagnosis, hand, information processing, parkinsonism, tremor, 1240
 - computer program, digital computer, mathematic model, molecular structure, pdp 10, 420
 - contour, photometry, 739
 - digital computer, electron microscopy, image processing, 3 d display, 2498
 - digital computer, holography, stereoscopy, 545
 - digital computer, man machine interaction, task performance, 540
 - digital display, radiation exposure, victoreen model 555, nodule, 297
 - diode, light, voltmeter, led array, 956
 - electrocardiography, movement, telemetry, television, 1354
 - electroencephalography, spectrometry, calculated by segments, 348
 - electromyography, extraocular muscle, muscle disease, neuropathy, spike, visual display, 704
 - hearing, hearing impairment, shorthand display, 2488
 - image display, scintiscanning, 3671
 - image processing, nuclear magnetic resonance, 582
 - kymography, oscilloscope, photography, frame identification, 2487
- disposable**, economy, hospital running cost, surgery, disposable products in surgery, usa, 198
- distal radioulnar joint**, biomechanics, radioulnar dislocation, biomechanics, 6 operative techniques, 2799
- diuresis**, computer model, digital computer, kidney tubule absorption, sodium, sodium depletion, water, 478
 - computer model, vasopressin, model aspects, 2960
 - henle loop, hydropenia, kidney medulla, kidney tubule, mathematic model, urea, human kidney, 2460
- diving**, body temperature, hyperbarism, telemetry, dog, 1000 fsw, 3582
 - carbon dioxide, dyspnea, exercise, functional residual capacity, helium, hyperbarism, lung volume, 49.5 ata, 6 divers, 1298

- cell membrane, heart rate, hydrostatic pressure, nerve cell, pacemaker, mouse, rat, guinea pig, rabbit, dog, 3692
- computer, electroencephalography, olfactory bulb, caiman, analysis, 1168
- doctor patient relation**, computer, physician, quality control, 2683
- documentation**, computer, diagnosis, epidemic, pharmacotherapy, 2329
 - computer, literature, lisp, personal documentation, 1982
 - data base, hospital service, information processing, literature, public health service, network, heclinet system, gfr, 1228
 - digital computer, literature, university London, 3849
- dopamine**, acetylcholine, cholinergic system, computer model, dopamine system, extrapyramidal system, haloperidol, theoretical aspects, 3328
 - body temperature, electric field, hyperthermia, hypothalamus, microwave radiation, noradrenalin, serotonin, rat, 2579
- dopamine system**, acetylcholine, cholinergic system, computer model, dopamine, extrapyramidal system, haloperidol, theoretical aspects, 3328
- doppler ultrasound flow meter**, anemometry, laser, 154
 - aorta, artery flow, blood flow, blood vessel, carotid artery, femoral artery, transcutaneous vs implanted cuff, 224
 - arteriography, atherosclerosis, carotid arteriography, ultrasonics, real time ultrasonic imaging system, 3676
 - artery, artery elasticity, blood pressure, echography, elasticity, mathematic model, 435
 - artery, artery flow, femoral artery, information processing, model, transfer function model, 3543
 - artery occlusion, hemodynamics, pulsatile flow, hydrodynamic bench, 3167
 - artery wall, ultrasonics, motion parameter, 2063
 - blood flow, digital computer, information processing, ultrasonics, 2755
 - blood flow, applications, prospects, 1384
 - blood flow, capillary flow, laser, laser doppler measurement, 3694
 - blood flow, echography, transit time, 740
 - blood flow, heart catheterization, deep arteries, 225
 - blood flow, breast cancer, cancer screening, ultrasonics, 3015
 - blood flowmetry, flowmeter, 3708
 - brain atherosclerosis, carotid endarterectomy, stroke, diagnosis, 2962
 - coronary artery, heart surgery, ultrasonics, localization of coronary artery, 3689
 - coronary artery blood flow, echocardiography, noninvasive measurement, 1020
 - decompression, spectrometry, ultrasonics, decompression data, 1022
 - echocardiography, on line graphical method, graphical display system, 1827
 - echography, fetus, pulsed doppler system, 1428
 - fetus, fetus heart rate, stethoscope, fetus viability, monkey, 1040
 - fetus heart rate, monitoring, new technique, 1552
 - flowmeter, readout, 1380
 - fourier transform, image processing, signal processing, convolution method, 3028
 - heart valve disease, ultrasonics, 2926
 - spectrometry, ultrasonics, spectrum broadening, 2283
 - stethoscope, varicocele, doppler stethoscope, value, 1449
 - telemetry, implantation, design, dog, 3622
 - pulsed flowmeter, evaluation, accuracy, 1382
- dorsal root potential**, computer, microelectrode, nerve cell potential, spinal cord posterior horn, substantia gelatinosa, very small neuron, activity isolation method, mouse, 1238
- dorsal spinocerebellar tract**, mathematic model, nerve cell membrane steady potential, nerve cell potential, potassium, afterhyperpolarization, cat, 3179
- dorsum sellae**, brain aqueduct, brain stem, brain tomography, computer assisted tomography, fourth brain ventricle, transverse cut, frontal cut, clivo parallel cut, method, human brain model, 2716
- dose**, linear tomography, tomography, automatic dose rate control, 2728
- dose calculation**, cobalt therapy, computer, megavoltage radiotherapy, central axis dose, 2741
- dose response**, anticoagulant agent, computer program, thrombosis, long term control, 1172
 - cancerogenesis, computer program, nuclear radiation, radiotherapy, value, 2331
 - cellular immunity, mathematic model, migration inhibition, migration assay, 19
- dosimetry**, argon, heavy particle radiation, tissue equivalent, 726
 - background radiation, decision, model, radioactivity, statistics, statistical interpretation of counting data, 306
 - beam profile, roentgen apparatus, roentgen dose distribution, star test pattern, 315
 - beam profile, cobalt therapy, skin, skin test, 3373
 - beam profile, pion radiation, radiotherapy, 3372
 - beam profile, cancer, cobalt therapy, phantom, 3433
 - beryllium, fast neutron radiation, fast proton radiation, lithium, 2572
 - beryllium, deuteron radiation, fast neutron radiation, fast proton radiation, neutron generator,

- characterization of neutron beam, 2662
- beta radiation, phantom, gamma radiation, radiotherapy, roentgen radiation, tissue equivalent, 2928
- betatron, megavoltage radiotherapy, radiotherapy, tiddue maximum ratio, tumor maximum ratio, 2482
- betatron, linear accelerator, neutron radiation, radiation exposure, 2852
- body burden, prostate scintiscanning, zinc, zinc 69m, permissible body burden, 940
- bone, megavoltage radiotherapy, radiation attenuation, roentgen dose distribution, 2096
- californium 252, ionization chamber, roentgen dose distribution, liquid dielectric ionization chamber, 30
- calorimetry, computer assisted tomography, echography, ultrasonics, megahertz frequency, 1197
- cat, cobalt therapy, phantom, roentgen dose distribution, tissue inhomogeneities, 3432
- cobalt 60, fast electron radiation, lithium fluoride dosimeter, gamma radiation, radiotherapy, thermoluminescence, 1129
- cobalt 60, ionization chamber, phantom, gamma radiation, radiotherapy, 3013
- cobalt therapy, medulloblastoma, treatment technique, 3376
- computer, linear accelerator, megavoltage radiotherapy, 3081
- computer, gold 198, iridium 192, radioisotope therapy, 2723
- computer, fast electron therapy, decrement curve, 2722
- computer, gynecologic cancer, radioisotope therapy, radiotherapy, 1200 cases, 1220
- computer, radiation field, radiotherapy, irregular field computer program, 2358
- computer assisted tomography, film dosimeter, dosimetry system, 3082
- computer assisted tomography, deltascan 50 scanner, 1594
- fast electron therapy, effect air space on depth dose, 3380
- fast neutron radiation, fission neutron radiation, luminescence dosimeter, gamma radiation, 2159
- fast neutron radiation, geiger mueller counter, ionization meter, gamma radiation, radiotherapy, fast neutron sensitivity, 1128
- fast proton radiation, ferrous sulfate dosimeter, linear energy transfer, radiotherapy, 1130
- ferrous sulfate dosimeter, gamma radiation, radiotherapy, calibration comparison, 730
- function generator, heater, thermoluminescence, heating rate, 592
- heavy particle radiation, ionization chamber, thermoluminescence dosimeter, x ray film, radiation activation detector, radiobiological experiment, 1342
- industrial hygiene, noise, audio dosimeter, 2912
- ionizing radiation, radiation monitoring, radiation protection, automatic badge reading, 3390
- iridium 192, decautron remote afterloading, 3752
- linear accelerator, megavoltage radiotherapy, 3666
- linear accelerator, megavoltage radiotherapy, radiation detection, silicon diode, 2664
- mammography, radiation scattering, back scattering, 3371
- mammography, roentgen tube, transmolybdenum tube, 3763
- mathematic model, phantom, radiation exposure, japanese adult, 99
- megavoltage radiotherapy, 10 mv, 591
- megavoltage radiotherapy, radioactivity, roentgen radiation, 45 mv, 732
- megavoltage radiotherapy, tissue compensator, 3762
- negative pion radiation, radiotherapy, roentgen dose distribution, 1127
- neutron radiation, gamma radiation, determination of dosimeter sensitivity, 2160
- noise pollution, sound level measurement, ear borne dosimeter, 1509
- radiation dose fractionation, radiation field, radiotherapy, time dose effect, matching of adjacent fields, 2670
- radiation exposure, thallium 201, nuclear parameter, 301
- radiation exposure, radiodiagnosis, energy dependence, 2278
- radiation field, radiotherapy, irregularly shaped field, 744
- gamma radiation, thermoluminescence, automation, 1015
- gamma radiation, radiotherapy, p n junction, temperature drift, semiconductor dosimeter, 1922
- gamma radiation, radiotherapy, thermoluminescence, signal noise ratio, differential method, 3788
- radiotherapy, radiotherapy facility, 1913
- dream content**, computer, retrieval system, no coding, 2309
- drill**, ototome, new drill, 2989
- drinking**, circadian rhythm, photoelectric cell, recording system, rodent, primates, 1503
- drinking device**, integrated circuit, licking, transducer, device, 1350
- drinking water**, computer, mass spectrometry, organic compound, surface water, water pollution, united states, trace analysis, 3796
- droplet size**, anemometry, laser, 3612
- drowsiness**, alpha rhythm, artifact, automation, delta rhythm, electroencephalography, theta rhythm, 31
- subjects, artifact rejection, 1947
- electricity, excitability, fatigue, headache, nausea, worker, high voltage field, environmental effects, 3106
- drug**, cell, iontophoresis, membrane capacitance, time course, 483
- computer, drug cost, drug prescription, hospital, nurse, pharmacy, physician, ctl modular 1 computer, 3049

drug absorption, pharmacokinetics, dose law, model, 2385

drug abuse, brain atrophy, cannabis, computer assisted tomography, no evidence, 19 patients, 1577

drug administration route, drug half life, mathematic model, pharmacokinetics, 1628

drug analysis, computer, mass spectrometry, pattern recognition, pharmacology, structure activity relation, 3092

drug clearance, bioavailability, blood cell aggregation, drug metabolism, drug protein binding, enzyme, liver blood flow, mathematic model, pharmacokinetics, review, 3108

drug cost, computer, drug, drug prescription, hospital, nurse, pharmacy, physician, cpl modular 1 computer, 3049

- hospital management, costs, gfr, 3043

drug delivery system, mathematic model, 369

drug dependence, correlation function, family psychiatry, heroin, statistics, 3494

drug distribution, amnion fluid, amnion sac, drug metabolism, fetus, placenta transfer, guinea pig, rabbit, gettinger miniature pig, intraamniotic application method, intraamniotic administration, 3717

drug dose, algorithm, cancer chemotherapy, hodgkin disease, pharmacotherapy, oncology center, 351

- cancer chemotherapy, cell cycle, deoxyribonucleic acid, drug resistance, system analysis, model, mouse, 783
- cell, restraining device, skin, skin dosing cell, rat, guinea pig, 607
- mathematic model, pharmacokinetics, computer, optimization, method, 1629

drug half life, cancer, computer program, folinate calcium, kidney failure, mathematic model, methotrexate, pharmacokinetics, 5 patients, 3435

- drug administration route, mathematic model, pharmacokinetics, 1628

drug interaction, bile, bromsulphophthalein, computer model, pharmacokinetics, warfarin, 3498

drug metabolism, amnion fluid, amnion sac, drug distribution, fetus, placenta transfer, guinea pig, rabbit, gettinger miniature pig, intraamniotic application method, intraamniotic administration, 3717

- bioavailability, blood cell aggregation, drug clearance, drug protein binding, enzyme, liver blood flow, mathematic model, pharmacokinetics, review, 3108
- drug protein binding, liver disease, mathematic model, pharmacokinetics, review, 21
- mathematic model, drug residue, mammals, 3120

drug monitoring, adverse drug reaction, epidemiology, mathematic model, pattern recognition, pharmacokinetics, public health, 1956

- adverse drug reaction, computer, lyons civil hospital, 1572

drug prescription, computer, drug, drug cost, hospital, nurse, pharmacy, physician, cpl modular 1 computer, 3049

- computer program, writing, writing assistance, 2296

drug protein binding, bioavailability, blood cell aggregation, drug clearance, drug metabolism, enzyme, liver blood flow, mathematic model, pharmacokinetics, review, 3108

- computer program, ligand, serum albumin, thyroxine, 1153
- drug metabolism, liver disease, mathematic model, pharmacokinetics, review, 21

drug release, biopharmaceutics, gastrointestinal tract, mathematic model, pharmacokinetics, 1627

drug resistance, cancer chemotherapy, cell cycle, deoxyribonucleic acid, drug dose, system analysis, model, mouse, 783

drug screening, calculator, toxicology, programmable calculator, 3791

drug sensitivity, antibiotic sensitivity, computer, information processing, 331

duodenum ulcer, balneology, exercise, heart rate, kinesiotherapy, telemetry, czechoslovakia, 522

dura mater, assisted circulation, heart left ventricle, valve, biolized intrathoracic device, 2188

- stereotaxic surgery, mathematical model, method, 672

dust, aerosol, industrial hygiene, particle counter, portable optical counter system, 3413

- air sampling, filter, dust loading characteristics, high inertial fibrous filters, 2863
- environment, smoke, electrostatic precipitator, precipitator, review, 3715
- particulate matter, respiratory tract, fine particle deposition, theoretical model, 3711

dye dilution curve, computer, heart output, hybrid computer, 3100

- heart output, monitoring, open heart surgery, thermodilution, 633

dynamography, ophthalmic artery, ophthalmodynamography, temporal artery, basic principles, methods, monograph, 251

dyslexia, color vision, visual stimulation, fading phenomena, 3732

- electrocardiography, evoked cortical response, evoked visual response, analyses automation, 1879

dyspepsia, computer assisted diagnosis, data base, stomach cancer, 762

dyspnea, carbon dioxide, diving, exercise, functional residual capacity, helium, hyperbarism, lung volume, 49.5 ata, 6 divers, 1298

- computer, forced expiratory volume, medical record, pneumoconiosis, subjective appreciation, 3847

ear, bone, cartilage, high frequency cinematography, grinding instruments, 326

ear densitometer, fiberoscope, heart output, output measurement, children, 2940

ear drum, auditory ossicle, electromagnet, mobility, objective mobility test, 3353

- auditory rehabilitation, magnet, electromagnetic induction, 687
- early receptor potential**, cornea, electrocardiography, electrode, wick electrode, bright flash ecg, 2998
- earmould**, hearing aid, model, resonance, sound filtering, side branch, parallel vent, acoustical model, electrical model, 3729
 - hearing aid, sound level, real ear canal, 2 cm³ coupler, zwislocki coupler, 3355
- ear protection**, industrial medicine, noise pollution, performance, 3350
 - noise, german federal republic, choice, 3750
- ear surgery**, guinea pig, operating table, 3399
- ear trauma**, auditory stress, environment, hearing, microphone, sound level measurement, conga microphone, 1019
 - hearing, industrial noise, noise, noise pollution, chinchilla, threshold shift, 1283
- echinococcosis**, computer assisted tomography, liver cyst, case report, 3800
- echo**, auditory masking, hearing, masking level differences, 701
 - environmental pollution, sound level measurement, free field measurement, enclosure, 193
 - hearing, intelligibility, signal processing, spectrometry, speech, 2819
 - hearing, hearing impairment, speech intelligibility, delayed speech, 2996
- echocardiography**, aorta valve regurgitation, pulse doppler, 65 cases, 599
 - automation, heart left ventricle, performance, ultrasonics, time to voltage analogue, converter, dog, 1455
 - b scan, congenital heart malformation, echotomography, heart disease, high speed b mode echocardiography, 500 cases, 1435
 - cardiography, echography, mitral valve, mitral valve stenosis, 20 normals, 718
 - cardiography, echography, image processing, ultrasonics, real time conversion, 1052
 - computer, 1201
 - computer, 764
 - computer, computer assisted diagnosis, heart catheterization, heart ventricle pressure, information processing, 1233
 - computer, hemodynamics, m mode, 1986
 - computer, three and two dimensional images, 2337
 - computer assisted tomography, exercise, heart catheterization, oxygen consumption, phonocardiography, invasive and noninvasive evaluation, human subject, 3416
 - coronary artery blood flow, doppler ultrasound flow meter, noninvasive measurement, 1020
 - doppler ultrasound flow meter, on line graphical method, graphical display system, 1827
 - echoencephalography, echography, gynecology, history, university of lund, 2193
 - echography, image processing, ultrasonics, digital image focusing, 1026
 - echography, abdomen echography, real time scanner, 3677
 - frequency analysis, 2911
 - glyceryl trinitrate, heart left ventricle volume, continuous assessment, 28 patients, analog conversion system, 644
 - heart movement, spatial movement, cardiophone, 1023
 - heart sound, oscillation, phonocardiography, water hammer, theory, 2214
 - mitral valve prosthesis, mitral valve stenosis, model, ultrasonics, three different mitral valve models, 427
 - mitral valve prosthesis, phonocardiography, 15 cases, 1434
 - tomography, application, 3264
 - ultrasonics, multitransducer scanner, 3263
 - real time side angle (60°C) sector scanner, 2175
 - technique, principles, 1825
 - reverberation, 1456
- echoencephalography**, brain death, cancer, cerebrovascular disease, echography, echotomography, ultrasonics, survey, 1826
 - brain hematoma, brain hemorrhage, computer assisted tomography, electroencephalography, 33 patients, 2720
 - brain ventricle, brain ventriculography, computer assisted tomography, 192 cases, 1585
 - echocardiography, echography, gynecology, history, university of lund, 2193
- echography**, abdomen, b scan, continuous raster scanning, 1429
 - abdomen, heart, image processing, ultrasonics, 3773
 - abdomen scintiscanning, abdominal abscess, abscess scanning, computer assisted tomography, gallium 67, 22 cases, 1175
 - amnion fluid, breathing mechanics, fetus, lung, time distance recorder, 2163
 - aorta subvalvular stenosis, cardiography, computer, mitral valve prolapse, mitral valve stenosis, pattern recognition, 3102
 - artery, artery elasticity, blood pressure, doppler ultrasound flow meter, elasticity, mathematic model, 435
 - artery flow, brachial artery, noninvasive measurement, 603
 - a scan, eye, digital display, instrumentation, method, 1091
 - attenuator, ultrasonics, automatic gain control, versatile attenuator, 1433

- blood, scattering, sound, ultrasonics, 1285
- blood, ultrasonics, sound scattering, 2280
- blood flow, doppler ultrasound flow meter, transit time, 740
- blood pressure, gas bubble, heart ventricle pressure, ultrasonics, noninvasive measurement, 1471
- blood pressure, carotid artery obstruction, eye pulse, ultrasonics, no touch measurements, 1473
- brain, brain ventricle, thalamus, two dimensional scanning of excised brain, normal anatomy, 1496
- brain death, cancer, cerebrovascular disease, echoencephalography, echotomography, ultrasonics, survey, 1826
- b scan, ultrasonics, speckle, 3678
- b scan, ultrasonics, grey scale, 2276
- burn, thermal trauma, determination, 2264
- calorimetry, computer assisted tomography, dosimetry, ultrasonics, megahertz frequency, 1197
- cardiography, electrocardiography, fetus heart rate, heart rate, monitoring, siemens partecust, 325
- cardiography, echocardiography, mitral valve, mitral valve stenosis, 20 normals, 718
- cardiography, echocardiography, image processing, ultrasonics, real time conversion, 1052
- cardiography, kinetocardiography, ultrasonic transducer, 2284
- computer, echooculography, tissue differentiation, digitization, 3803
- computer assisted tomography, kidney, pancreas, spleen, differential diagnosis, case report, 3817
- computer assisted tomography, malignant fibrous histiocytoma, pancreas pseudocyst, diagnosis of homogeneous mass, histopathology, 1186
- computer assisted tomography, radiotherapy, therapy, cross section determination, 2360
- correlation function, laser, light reflection, ultrasonics, 127
- digital computer, image processing, nuclear magnetic resonance, radiography, reprography, thermography, 3459
- doppler ultrasound flow meter, fetus, pulsed doppler system, 1428
- echocardiography, image processing, ultrasonics, digital image focusing, 1026
- echocardiography, abdomen echography, real time scanner, 3677
- echocardiography, echoencephalography, gynecology, history, university of lund, 2193
- electromyography, speech, ultrasonic transducer, new transducer, 3236
- heart muscle, sound attenuation, ultrasonics, 2656
- holography, holoscan, 1024
- image processing, ultrasonics, 1914
- image processing, ultrasonics, 2660
- image processing, ultrasonics, acousto electronic lens, 2269
- image processing, ultrasonics, transducer array, 3784
- model, ultrasonics, tissue model, liquid mixture with acoustic characteristics, 738
- radiation scattering, ultrasonics, 731
- radiotherapy, ultrasonics, review, 2267
- speech, vowel, vowel tenseness, 2908
- spleen, ultrasonics, 2673
- ultrasonics, bragg diffraction scanner, 602
- ultrasonics, echo structure, 1025
- ultrasonics, moving target, 2282
- measuring performance of equipment, 577
- echolocation**, binaural hearing, directional hearing, mathematic model, 3155
 - mathematic model, frequency stabilization, horseshoe bat, 3530
 - phenomenology, target direction determination, bat, 868
- echooculography**, a scan, b scan, m scan, ultrasonics, new device, 2167
 - a scan, gray scale echography, new device, 2910
 - computer, echography, tissue differentiation, digitization, 3803
 - computer assisted tomography, hyperthyroidism, neuropathy, orbit cancer, orbit nerve, orbit tumor, 144 cases, 1221
 - exophthalmos, melanocytoma, optic nerve coloboma, retinoblastoma, vitreous body hemorrhage, new equipment, manual compound scanning, 1100
 - eye movement, ultrasonic transducer, movement recording, 1804
- echotomography**, brain death, cancer, cerebrovascular disease, echoencephalography, echography, ultrasonics, survey, 1826
 - breast carcinoma, computer, mammography, time of flight echography, 3809
 - b scan, congenital heart malformation, echocardiography, heart disease, high speed b mode echocardiography, 500 cases, 1435
- ecology**, biology, computer, mathematic model, model, algorithm, 1788
 - computer, mediterranean ecosystem, 3607
 - computer model, model simplification, 3506
 - diffusion, equation, migration, nonlinear system, population model, differential equation, multispecies

- model, stability, 876
- genetics, population model, 34
- genetics, polymorphism, population model, stability, 2769
- mathematic model, population model, stability analysis, liapunov method, 423
- economy**, disposable, hospital running cost, surgery, disposable products in surgery, usa, 198
- ectopic beat**, electrocardiography, heart arrhythmia, monitoring, outpatient, 2294
- electrocardiography, extrasystole, mathematic model, stochastic model, poisson process, 21 patients, 2196
- heart infarction, heart muscle contraction, inotropism, strain gauge transducer, miniature segment length strain gauge, 2924
- edetate gallium ga 68**, computer assisted tomography, positron scintiscanning, scintillation camera, technetium 99m, emission computer assisted tomography, comparison, 1177
- edetic acid**, brain blood flow, brain scintigraphy, computer assisted tomography, gallium 68, krypton, positron emission tomography, positron scintiscanning, 120 cases, 799
- education**, accident prevention, college, safety, university, curriculum, safety professional, model, 1830
- auscultation, stethoscope, group teaching, wireless stethoscope type headphone, 3702
- computer, data base, gingiva, oral biopsy, tooth care, oral biopsy data, 8 dental schools, usa, 3471
- health science, 3403
- hospital, medical engineering, paramedical education, internship approach, 2382
- hospital, medical engineering, paramedical education, usa, 2381
- egg**, caffeine, calcium, cell membrane, methyladenine, oogenesis, theobromine, theophylline, hormone surface interaction, scanning electron microscopy, starfish, 3716
- egg transport, mathematic model, uterine tube, random walk model, 438
- egg transport**, egg, mathematic model, uterine tube, random walk model, 438
- ejection seat**, airplane pilot, emergency, mathematic model, model, body model, windblast force, aerodynamic force, articulated human body, emergency ejection, 2648
- elasticity**, age, aorta strip, aorta wall, collagen, thoracic aorta, human, 59-82 yr, 44
- angiography, cast, heart left ventricle, heart muscle, mathematic model, urethan, calculation of young's elastic modulus, 433
- aorta valve, aorta valve homograft, frozen aorta valve homografts, freezing methods, cadaver graft, 431
- artery, artery elasticity, blood pressure, doppler ultrasound flow meter, echography, mathematic model, 435
- artery, mathematic model, model, hydraulic model, elastic non uniformity, 46
- artery, 3540
- bone strength, long bone, tensile strength, tibia, dog, 429
- calcified tissue, calcium phosphate hydroxide, collagen, 1670
- carotid artery, clostridiopeptidase a, hyaluronidase, iodoacetate sodium, model, noradrenalin, pancreatopeptidase e, sodium cyanide, maxwell model, voigt model, 1656
- cell volume, erythrocyte membrane, viscosity, human, 215
- chorda tendinea, mitral valve, dynamic elasticity, human tendineae, 1663
- erythrocyte, erythrocyte membrane, elastic deformation, 891
- erythrocyte membrane, nystatin, elastic area, compressibility, 2797
- femoral vein, jugular vein, shear stress, dog, 2793
- flow, lecithin, mathematic model, shear rate, suspension, viscosity, 1710
- flow, oscillation, tube, collapsible tube, 1705
- knee, patellofemoral joint, viscosity, contact study, 1114
- mathematic model, urethra urine flow, female urethra, 925
- model, temporomandibular joint, small forces, model, human, 49
- muscle, viscosity, resting muscle, frog, 893
- elastic tube**, airway, forced expiratory volume, lung compliance, tube flow, wave speed theory, 1714
- elastomer**, avcothane, biocompatibility, artificial surface, surface structure, in vitro, 1244
- elbow**, biomechanics, joint mobility, pronation, supination, 100 volunteers, 1658
- orthosis, polypropylene, flail elbow orthosis, 70 yr old woman, 1119
- electret**, callus, fracture, electrodynamic callus, electrostatic callus, rat, 1528
- electric accident**, artificial heart pacemaker, dentistry, guidelines, 2927
- cardiology, electronic instrument, medical engineering, 2591
- catheter, electrode, heart catheterization, heart ventricle fibrillation, conductive catheter, 2594
- conductivity, floor covering, gas discharge, medical instrumentation, safety, 2292
- coronary care unit, emergency ward, hospital, intensive care, labor room, operating room, recovery room, safety, maryland lutheran hospital, 502
- electric device, hospital, medical engineering, monitoring, power supply, electrical plug, safety precaution, 1138
- electrocardiography, medical engineering, monitoring, 748
- electrocardiography, power line interference, iec recommendation june 1976, 3235
- electrocardiography, monitoring, 1139

- electronic instrument, leakage tester, 2291
- explosion, operating room, survey, 102
- heart catheterization, heart fibrillation, electrode area, stimulus duration, 2210
- hospital, monitoring, 100
- monitoring, review, 1550
- electric device**, electric accident, hospital, medical engineering, monitoring, power supply, electrical plug, safety precaution, 1138
 - safety, alternating current plug, test, inspection, 943
- electric field**, body temperature, dopamine, hyperthermia, hypothalamus, microwave radiation, noradrenalin, serotonin, rat, 2579
 - cell membrane, cell membrane potential, mathematic model, ionic solution, 3176
 - colloid, deoxyribonucleic acid, fluorescence, macromolecule, induced fluorescence, 1831
 - communication, termites, 670
 - computer model, digital computer, steady potential, 82
 - dielectric constant, electromagnetic radiation, muscle, 2851
 - electrophoresis, microelectrophoresis, alternating field, 609
 - environment, magnetic field, high voltage transmission line, biological hazard, 2092
 - environment, magnetic field, mathematic model, ultra high voltage line, biological hazard, 2091
 - frequency analysis, mathematic model, nerve fiber membrane potential, volume conductor, 932
 - light modulator, electrochromism, 576
 - oil mist, vacuum, mist precipitator, 153
 - perception, generation, bee, 257
- electric filter**, notch filter, selective amplifier, 512
 - speech synthesizer, discrete time filter, 232
- electric interference**, electrocardiography, noise removal, cubic splines and state space method, 2596
 - electron microscopy, magnetic field, scanning microscopy, ac field compensation, 129
 - electrophysiology, monitoring, 2964
 - medical electronics, interference simulator, 104
- electricity**, blood clotting, fibrinolysis, dog, 1039
 - blood clotting, fibrinogen, dog, 2921
 - brain, brain hemorrhage, electric trauma, hydrocephalus, pneumoencephalography, subarachnoid hemorrhage, cat, dog, man of 25, 239
 - colon tenia, hodgkin huxley equation, mathematic model, smooth muscle, smooth muscle tone, guinea pig, 2037
 - drowsiness, excitability, fatigue, headache, nausea, worker, high voltage field, environmental effects, 3106
 - nuclear reactor, candu type reactor, 3565
 - 114
- electric model**, electrocardiography, heart muscle conduction system, 2076
 - epithelium, model, sodium, sodium pump, 2395
- electric motor**, disk motor, 3487
 - motor driven load, inertia measurement, 145
- electric organ**, potassium channel, sodium channel, temperature, electric fish, 76
- electric resistance**, ammonium derivative, lipid membrane, tetrapentyl ammonium cation model, theoretical aspects, bilayer membrane, in vitro, 560
- electric shock**, defibrillation, half cycle sinusoid, dog, 1860
 - restraining device, stress, tail, system, free moving rat, 2965
- electric trauma**, brain, brain hemorrhage, electricity, hydrocephalus, pneumoencephalography, subarachnoid hemorrhage, cat, dog, man of 25, 239
 - burn, electrocoagulation, intestine trauma, laparoscopy, uterine tube, uterine tube sterilization, 659
- electric wheelchair**, handicapped child, supine position, 1525
 - quadriplegia, voice, voice control, 1112
- electrocardiography**, alarm monitoring, computer, heart infarction, heart ventricle arrhythmia, 2 computer programs comparison, 1568
 - algorithm, computer, mathematic model, qrs complex, vectorcardiography, wave recognition algorithm, chest, 3180
 - alternating current, interference, interference suppression, monitoring, removal of ac current interference, 2133
 - amplifier, electroencephalography, electromyography, optoelectronic transducer, 2099
 - aorta balloon, artery counter pulsation, assisted circulation, computer, trigger, optimum performance determination, 3098
 - aorta stenosis, aorta valve disease, aorta valve regurgitation, computer, heart left ventricle hypertrophy, vectorcardiography, 257 patients, 2323
 - artery pulse, computer, heart left ventricle ejection time, heart sound, heart systolic time interval, surgery, pdp 11, real time, 851

- artifact, electroencephalography, model, skin, abrasion, skin dystrophy, skin injury, skin potential, sweating, transcutaneous stimulation, wound healing, 3234
- artifact reduction, electroencephalography, movement, skin abrasion, skin electrode, 1389
- artificial heart pacemaker, telemetry, 965
- artificial heart pacemaker, frequency modulation, monitoring, telemetry, telephone telemetry, 2678
- assisted circulation, coronary care unit, fluoroscopy, hemodynamics, monitoring, 3353 patients, 30 bed coronary care unit, 217
- averaging, digital computer, monitoring, vectorcardiography, 344
- averaging, electroencephalography, fourier transform, phase locking, 1945
- aviation, electroencephalography, electromyography, respiration, skin conductance, inexpensive recording method, 296
- balneotherapy, monitoring, telemetry, 969
- bed, body posture, monitoring, false alarm by body position in bed, 227
- behavior, computer, hippocampus, behavior quantification, 2758
- blood pressure, central venous pressure, computer, electroencephalography, monitoring, 781
- blood pressure, cardiometer, heart rate, 2917
- blood pressure, systolic blood pressure, automatic slope display, 652
- body, mathematic model, thorax electric field, 1314
- body posture, heart infarction, heart rate, st segment, thorax electric field, 35 precordial leads, method, 1049
- brain cortex, hippocampus, hippocampus potential, mathematic model, dorsal hippocampus slope, 2476
- brain depth recording, brain depth stimulation, commutator, lightweight, multi contact, 2966
- brain tumor, cerebrospinal fluid, electroencephalography, hematoma, intracranial hypertension, pneumoencephalography, telemetry, 20 cases, continuous recording, technique, 1487
- breathing rate, heart rate, lung ventilation, sailor, ship, skin temperature, telemetry, workload, seagoing ship, 524
- burn, electrode, monitoring, operating room, 3033
- cardiography, echography, fetus heart rate, heart rate, monitoring, siemens partecust, 325
- cassette recorder, electroencephalography, physiology, plethysmography, sexual arousal, sexuality, vagina, vaginal photoplethysmography, cassette recorder, 1883
- cerebrovascular accident, prognosis, automated analysis, 6 serial eeg, 26 volunteers, 1949
- computer, electromyography, information processing, stationarity and normality test, 2326
- computer, petit mal, spike wave, prolonged recording, on line, 5 cases, 2325
- computer, diagnosis, 2322
- computer, frequency analysis, dominant component evaluation, 2760
- computer, telephone telemetry, remote analysis, 978
- computer, coronary care unit, heart arrhythmia, heart infarction, heart ventricle arrhythmia, 2293
- computer, heart rate, telemetry, one line measurement, bird, 2375
- computer, heart left ventricle ejection fraction, qrs complex, q wave, r wave, relation qrs forces to left ventricle ejection fraction, 2699
- computer, exercise test, ischemic heart disease, optimal measurement, 2698
- computer, computer program, telemetry, electric noise, artefact suppression, noise rejection, 2867
- computer, heart arrhythmia, heart ventricle extrasystole, counting ectopic beats, 345
- computer, medical record, monitoring, 24 hr monitoring, 343
- computer, exercise test, heart rate, baseline estimation, 3422
- computer, exercise, heart rate, lung function, oxygen consumption, tidal volume, breath-by-breath respiratory measurements, 1615
- computer, heart arrhythmia, monitoring, 3054
- computer, digital computer, exercise, thorax electric field, precordial isopotential map, 1235
- computer, cost, task force, 2702
- computer, cost, monitoring, physician, safety, over and underutilization, contribution to diagnosis, task force, 2701
- computer, task force, 2700
- computer, heart infarction, 33 cases, polarcardiographic examination of old infarcts, 1165
- computer, electromyography, ergonomics, error, exercise electrocardiography, heart rate, quality control, 1164
- computer, heart arrhythmia, analysis, 2319
- computer, minnesota code, 2318
- computer, vectorcardiography, impact on cardiologist interpreter of scalar electrocardiogram, 2317
- computer, computer assisted diagnosis, mass screening, 772
- computer model, multipole expansion, 1941
- cornea, early receptor potential, electrode, wick electrode, bright flash eeg, 2998
- coronary care unit, thorax electric field, precordial eeg mapping, 3693
- coronary care unit, digital computer, monitoring, 771

- data base, task force, 2916
- data reduction, data transmission, telemetry, vectorcardiography, 1773
- data reduction, data transmission, information processing, microprocessor, telemetry, 1944
- diagnosis, digital computer, 1943
- digital computer, medical record, simplified record, 1227
- digital computer, information processing, rs t complex, 346
- digital computer, heart ventricle systole, his bundle potential, 1942
- display system, movement, telemetry, television, 1354
- dyslexia, evoked cortical response, evoked visual response, analyses automation, 1879
- ectopic beat, heart arrhythmia, monitoring, outpatient, 2294
- ectopic beat, extrasystole, mathematic model, stochastic model, poisson process, 21 patients, 2196
- electric accident, medical engineering, monitoring, 748
- electric accident, power line interference, iec recommendation june 1976, 3235
- electric accident, monitoring, 1139
- electric interference, noise removal, cubic splines and state space method, 2596
- electric model, heart muscle conduction system, 2076
- electrode, electromyography, static electricity, disturbance by exogenous static electricity, 1000
- electrode, heart catheterization, monitoring, chest lead, radiotransparent electrode, 1548
- electrode, electroencephalography, electromyography, electrooculography, pasteless electrode, 158
- electrode, exercise electrocardiography, hyperventilation, medical instrumentation, quality control, standards, task force, 3291
- electrode, electrical characteristics, 2883
- electroencephalography, multichannel recorder, tape recorder, telemetry, digital recording, 1360
- electromagnetic radiation, signal noise ratio, telemetry, los angeles, 1359
- electromyography, on line evaluation, emg elimination, 1057
- endocardium, heart stimulation, stimulation threshold, amplitude unipolar endocardial electrogram, 2595
- fetus, signal noise ratio, real time ecg, 480
- fetus electrocardiography, information processing, vectorcardiography, fetus, 2478
- fetus electrocardiography, noninvasive extraction, 749
- fourier transform, deconvolution method, 2479
- frequency analysis, recording, st segment, high side frequency filtration, 639
- heart, heart electric field, magnetic field, magnetocardiography, rectangular and spherical coordinates, 2590
- heart arrhythmia, statistics, 1863
- heart left ventricle ejection time, heart systolic time interval, monitoring, ambulatory interval monitoring, 2194
- heart model, application, 1319
- heart rate, analysis, long term recording, 635
- heart rate, rate recording, unrestrained rat, 1042
- his bundle electrogram, measurement device, 1045
- his bundle potential, high frequency ecg, external recording, dog, 2200
- information processing, lead information content, 2884
- information processing, filtering, sampling, 433 normals and patients, 2703
- ink writing, recording, st segment, st distortion, direct writing recorders, 1051
- interference, signal detection, signal noise ratio, high frequency ecg, 1749
- ischemic heart disease, high fidelity ecg vs ordinary for 'normal' patients, 1044
- mathematic model, limit cycle model, 1733
- monitory, pulse, skin conductance, transducer, volume, multifunction transducer, 1142
- phonocardiography, telemetry, 2931
- respiration, telemetry, low power, 529
- signal noise ratio, fine structure analysis, 2941
- telephone telemetry, 3 lead ecg, post office telephone line, 977
- multivariate analysis, 9 lead system, frank leads, mathematical analysis, 88
- electrocoagulation**, brain, high frequency generator, 2865
 - burn, electric trauma, intestine trauma, laparoscopy, uterine tube, uterine tube sterilization, 659
 - computer, electrode, gastrointestinal hemorrhage, gastroscopy, stomach ulcer, dogs, computer controlled electro coagulation, 3058
- electroconvulsive therapy**, audioamplifier, electromyography, muscle relaxation, 1500
- electroconvulsiography**, brain cortex, electroencephalographv, mathematic model, meninx, source tangential layer, 492
 - brain depth recording, brain depth stimulation, electrode, for use in human, 680
 - electromyography, rem sleep, sleep, stage 3 sleep, rat, sleep stage, automation, 1995
- electrode**, acoustic nerve, cochlea, electrostimulation, scala tympani, nerve survival, stimulation pattern, cat, 3339
 - artificial heart pacemaker, heart arrhythmia, heart atrioventricular block, 22 cases, epicardial screw in

- electrode, 631
- artificial heart pacemaker, endocardial electrode, low threshold endocardial electrode, 642
- artificial heart pacemaker, heart stimulation, stimulation threshold, comparative study, thresholds in leads of different size, 640
- artificial heart pacemaker, elema emt 588 k, 47 patients, 2603
- artificial heart pacemaker, sutureless pacemaker lead, 1043
- artificial heart pacemaker, electrode model, tip stitched in myocardium, 3298
- artificial heart pacemaker, embolism, lung embolism, catheter embolism, migrating of retained pacemaker, 1479
- artificial heart pacemaker, heart stimulation, electrode surface area, 1054
- artificial heart pacemaker, mediastinum, sinus node, transmediastinal atrial sensing electrode placement, atrial programmed pacemaker, 31 cases, 1053
- artificial heart pacemaker, electrostimulation, endocardial pacing, heart, rate of electrode displacement, 1050
- artificial heart pacemaker, skin electrode, stimulation, thorax wall, external pacemaker, stimulation through subcutaneous pin electrodes, 2192
- auditory stimulation, auditory system, cochlea microphonic potential, sound, electrophonic effect, 689
- auditory system, evoked response audiometry, suction pressure electrodes, 695
- bladder, bladder pacemaker, implant, micturition, paraplegia, quadriplegia, spinal cord injury, urethra, baboon, 1486
- brain, nerve cell potential, film electrode probe, 2545
- brain cortex steady potential, mercurous chloride, spreading cortical depression, rat, 2230
- brain depth recording, brain depth stimulation, electrocorticography, for use in human, 680
- brain depth recording, brain depth stimulation, videorecording, electrode location, animal, 3726
- brain depth recording, brain depth stimulation, insulating device, 240
- brain depth stimulation, in vitro model, 3322
- brain depth stimulation, brain edema, electrode impedance, glucocorticosteroid, mannitol, seizure, somatomotor epilepsy, visual cortex, cat, 1489
- brain impedance, specific impedance measurement, human, 1807
- burn, electrocardiography, monitoring, operating room, 3033
- cancer surgery, electrosurgery, new instruments, 2681
- carbon, electrode impedance, glassy carbon electrodes, 999
- cardiocotography, fetus, fetus monitoring, scalp, stainless steel, fine stainless steel wire, 100 cases, 3395
- catheter, electric accident, heart catheterization, heart ventricle fibrillation, conductive catheter, 2594
- cochlea, deafness, hearing aid, implantation, prosthesis, multiple electrode system, 3341
- cochlea microphonic potential, external ear canal, ear canal electrode plug, children, 1104
- computer, electrocoagulation, gastrointestinal hemorrhage, gastroscopy, stomach ulcer, dogs, computer controlled electro coagulation, 3058
- cornea, early receptor potential, electrocardiography, wick electrode, bright flash ecg, 2998
- cornea, c potential, electroretinography, retina, sclera, rabbit, 557
- cranial nerve, electrostimulator, nerve stimulation, pons angle, apparatus, 678
- defibrillation, electrode paste, impedance, model, interface material testing, 3698
- defibrillation, direct current, paddle electrode size, 1845
- defibrillation, electrode paste, skin, thorax impedance, paddle electrode paste, comparison, 2190
- electrocardiography, electromyography, static electricity, disturbance by exogenous static electricity, 1000
- electrocardiography, heart catheterization, monitoring, chest lead, radiotransparent electrode, 1548
- electrocardiography, electroencephalography, electromyography, electrooculography, pasteless electrode, 158
- electrocardiography, exercise electrocardiography, hyperventilation, medical instrumentation, quality control, standards, task force, 3291
- electrocardiography, electrical characteristics, 2883
- electrode impedance, oxidation reduction reaction, review, 2540
- electrodiagnosis, electromyography, teflon failure, 2538
- electroencephalography, epilepsy, telemetry, telephone telemetry, 975
- electroencephalography, mathematic model, meninx, scalp, 2469
- electromyography, electrode connectors, apparatus, 157
- electromyography, muscle, surface electrode, high pass filter technique, 2644
- electromyography, 1391
- electromyography, multiple electrode, 2135
- electroretinography, new device, 267
- electrostimulation, nervous system, platinum electrode, electrochemical reaction, 1490
- finger, impedance, plethysmography, electrode configuration, 1911
- glass electrode, microelectrode, stereotaxic surgery, filling procedure, 1888
- heart muscle, needle electrode, multipolar electrode, beating heart, construction, 2923
- heart ventricle fibrillation, excitation propagation measurement, animal, 1470

- impedance, electrode guarding, antigen, 2136
- silver, silver chloride, submaxillary gland, voltage clamp, rabbit, 3233
- skin, skin impedance, electrodes, influence, 2888
- electrode impedance**, artificial heart pacemaker, current density, electrode surface geometry, current consumption, 2197
- brain depth stimulation, brain edema, electrode, glucocorticosteroid, mannitol, seizure, somatomotor epilepsy, visual cortex, cat, 1489
- carbon, electrode, glassy carbon electrodes, 999
- electrode, oxidation reduction reaction, review, 2540
- platinum, polarization impedance, 1890
- platinum electrode, time domain analysis, 2885
- electrode paste**, defibrillation, electrode, impedance, model, interface material testing, 3698
- defibrillation, electrode, skin, thorax impedance, paddle electrode paste, comparison, 2190
- gold, oxygen tension electrode, thin film electrode, 2891
- electrodiagnosis**, electrode, electromyography, teflon failure, 2538
- electroejaculation**, impedance, intestine, prostate, bull, 2957
- electroencephalography**, alertness, computer, electromyography, rem sleep, sleep, telemetry, rat, automatic analysis, 2111
- alertness, computer, electromyography, 5 hydroxytryptophan, levodopa, rem sleep, sleep spindle, stage 3 sleep, automatic classification, cat, 1620
- algorithm, epilepsy, analysis, 347
- alpha rhythm, biofeedback, statistical properties, 6 volunteers, 83
- alpha rhythm, brain depth recording, 81
- alpha rhythm, beta rhythm, computer, mu rhythm, analysis, 500 eeg's, 1570
- alpha rhythm, recognition method, 556
- alpha rhythm, computer, multichannel recorder, rem sleep, sleep, 10 subjects, automation, 2706
- alpha rhythm, beta rhythm, computer, delta rhythm, theta rhythm, 306 subjects, normal value, computer analysis, 2705
- alpha rhythm, artifact, automation, delta rhythm, drowsiness, theta rhythm, 31 subjects, artifact rejection, 1947
- ammonium, aspartate aminotransferase blood level, brain edema, computer, encephalopathy, exchange blood transfusion, fatty liver, furosemide, mannitol, reye syndrome, 7 children, 779
- amplifier, electromyography, interference, telemetry, powerline interference, 1362
- amplifier, electrocardiography, electromyography, optoelectronic transducer, 2099
- amygdaloid nucleus, kindling, mathematic model, first approximation model, 2475
- anesthesia, computer, frequency analyzer, hypoxia, microprocessor, minicomputer, monitoring, display system, cerebral function analyzer monitor, 3805
- anesthesia, brain, intensive care, monitoring, 2676
- anesthetic agent, blood chemistry, blood pressure, computer, monitoring, open heart surgery, temperature, patient monitoring system, 350
- arm prosthesis, blood pressure, digital computer, heart catheterization, microprocessor, monitoring, prosthesis, 2685
- artifact, electrocardiography, model, skin abrasion, skin dystrophy, skin injury, skin potential, sweating, transcutaneous stimulation, wound healing, 3234
- artifact reduction, electrocardiography, movement, skin abrasion, skin electrode, 1389
- audioamplifier, computer, 2708
- automation, spectrometry, method, 1387
- automation, computer, computer assisted diagnosis, sleep electroencephalography, sleep waking cycle, review, analysis methods, 1569
- automation, computer, evoked response audiometry, 855
- automation, epileptic focus, spike, autoregressive filter model, 4 patients, spike and wave, 1946
- automation, information processing, sleep, eeg data processing chain, 778
- automation, computer, frequency analysis, information processing, 776
- automation, computer, information processing, 773
- averaging, digital filtering, application, 2516
- averaging, parameter extraction, signal processing, 1753
- averaging, digital computer, digital filtering, evoked response, evoked visual response, model, 3727
- averaging, electrocardiography, fourier transform, phase locking, 1945
- aviation, electrocardiography, electromyography, respiration, skin conductance, inexpensive recording method, 296
- blood pressure, central venous pressure, computer, electrocardiography, monitoring, 781
- brain, magnetic field, mechanism, 1340
- brain atrophy, computer assisted tomography, epilepsy, head trauma, traumatic epilepsy, 78.070.297.P cases, 2330

- brain atrophy, brain calcification, brain ischemia, brain tomography, brain tumor, computer assisted tomography, partial epilepsy, porencephaly, 200 cases, 787
- brain atrophy, central nervous system metastasis, computer assisted tomography, encephalitis, epilepsy, partial epilepsy, tonic clonic epilepsy, 99 cases, 829
- brain cortex, electroencephalography electrode, seizure, laminar exploration, skin film technology, 555
- brain cortex, electrocorticography, mathematic model, meninx, source tangential layer, 492
- brain depth stimulation, electrosleep, sleep, stimulation, need activation, artificial sleep, 1499
- brain edema, cerebrospinal fluid, head trauma, hematoma, intracranial hypertension, tumor, cat, epidural pressure measurement, 1076
- brain hematoma, brain hemorrhage, computer assisted tomography, echoencephalography, 33 patients, 2720
- brain mapping, topography, method, 927
- brain tumor, computer assisted tomography, 111 cases, 1574
- brain tumor, cerebrospinal fluid, electrocardiography, hematoma, intracranial hypertension, pneumoencephalography, telemetry, 20 cases, continuous recording, technique, 1487
- cassette recorder, electrocardiography, physiology, plethysmography, sexual arousal, sexuality, vagina, vaginal photoplethysmography, cassette recorder, 1883
- computer, rem sleep, sleep, spindle, spindle detection, 4 volunteers, 4 patients, phase locked loop, 3424
- computer, telemetry, 3 channel, automatic noise rejection, 966
- computer, minicomputer, automation, stationary point detection, 3055
- computer, signal processing, daily routine, 2710
- computer, automatic selection, 2709
- computer, sleep, hypnogram, 2707
- computer, frequency analysis, psychologic test, wechsler scale, intellectual factor, 56 children, 2704
- computer, diving, olfactory bulb, caiman, analysis, 1168
- computer, period analysis, normative data, 26 subjects, 1166
- computer, microcomputer method, simple elements analysis, 777
- computer assisted tomography, neuroradiology, comparison, 1202
- computer assisted tomography, organic psychosis, psychosis, 12 children, 3446
- computer assisted tomography, frequency analysis, scalp, 350 intracerebral organic lesions, 3425
- computer assisted tomography, evoked somatosensory response, stroke, human, 2335
- convulsion, sphenoid electrode, long term monitoring, 100 cases, apparatus, 668
- correlation function, spectrometry, 349
- correlation function, evoked response, information processing, 1948
- digital computer, fourier transform, spectrometry, 3806
- digital computer, pattern recognition, adaptive segmentation, 1952
- digital computer, 1167
- discriminatory analysis, kidney failure, 3333
- display system, spectrometry, calculated by segments, 348
- electrocardiography, multichannel recorder, tape recorder, telemetry, digital recording, 1360
- electrocardiography, electrode, electromyography, electrooculography, pasteless electrode, 158
- electrode, epilepsy, telemetry, telephone telemetry, 975
- electrode, mathematic model, meninx, scalp, 2469
- electromagnetic radiation, psychiatry, telemetry, 972
- electromyography, sleep, telemetry, rat, fm-am transmitter, 2110
- electromyography, electrooculography, information processing, sleep, multidimensional analysis, 1082
- electrooculography, epilepsy, sleep, telemetry, videorecording, automatic analysis, visual analysis, video recording, closed circuit, 1884
- electroretinography, microelectrode, nerve cell potential, oxygen electrode, platinum electrode, double barrelled electrode, simultaneous measurement, 2142
- epilepsy, multichannel recorder, tape recorder, telemetry, 27 days recording, 976
- epilepsy, telemetry, paroxysmal activity, 2868
- epilepsy, 10 cases, automated detection, 1721
- epilepsy, excitatory postsynaptic potential, feedback system, filter, inhibitory postsynaptic potential, model, nerve cell network, neuron population, 3548
- evoked cortical response, evoked lateral geniculate response, information processing, mathematic model, cat, 89
- evoked cortical response, vagus nerve, nerve stimulation, cat, 2972
- evoked response, signal processing, spectrometry, wave, 1740
- evoked response, preamplifier, signal noise ratio, 1891
- evoked response, statistics, filter evaluation, 1083
- evoked somatosensory response, multiple sclerosis, 1748
- eye movement, automatic elimination, 3103
- filter, spike, detection, 2548

- frequency analysis, temporal analysis, quantification, 1388
- frequency analysis, statistical analysis, 1084
- frequency analysis, transient events, 775
- frequency analysis, quantification, 774
- frequency analysis, hemisphere, cat, 1878
- information processing, single epoch, 1747
- interference suppression, mains interference suppressor, 1071
- joint, mathematic model, movement, walking, automatic calculation method, human, 445
- mathematic model, cannonical expansion, analysis, 3331
- mathematic model, multivariant analysis, parametric time serum model, 936
- mathematic model, gaussian curve, comment, 2835
- meninx, multilayer flat cable, 2461
- monitoring, signal processing, surgery, 1140
- nerve cell potential, preamplifier, unrestrained animals, 110
- parameter extraction, rem sleep, sleep, time series, automatic classification, 1951
- signal noise ratio, 1745
- sleep, sleep electroencephalography, topology, 5 volunteers, analogue filter analysis, 1494
- telemetry, 12 channel, design, 118
- telephone telemetry, standards, method, apparatus, 238
- spline representation, 1752
- electroencephalography electrode**, brain cortex, electroencephalography, seizure, laminar exploration, skin film technology, 555
 - brain depth stimulation, stimulation threshold, striate cortex, visual cortex, visual prosthesis, macaque monkey, 1072
- electroglottography**, stroboscopy, vibration, vocal cord movement, 20 normal persons, 3242
- electrogustometry**, taste, taste sensation, impulse stimulation, new method, 2993
- electrolysis**, brain depth stimulation, cerebrospinal fluid, platinum electrode, non gassing limit, 2090
- electrolyte**, cell membrane permeability, compartment model, epithelial cell, mathematic model, weak electrolyte, 20
 - conductivity, 3630
- electrolyte balance**, blood, erythrocyte, magnetic field, plasma, potassium, sodium, rat, 1243
- electromagnet**, auditory ossicle, ear drum, mobility, objective mobility test, 3353
- electromagnetic field**, antenna, satellite, telemetry, 2107
 - artificial heart pacemaker, fluoroscopy, heart arrhythmia, interference, external demand pacemaker, 1041
 - diathermy, electromagnetic radiation, hyperthermia, microwave radiation, physiotherapy, 2178
 - electromagnetic radiation, environment, radiation absorption, radiation hazard, 584
 - skin, thermodynamics, measurements, review, 2429
- electromagnetic flowmeter**, aorta flow, heart output, automatic zeroing base line circuit, 1801
 - artery, blood vessel diameter, catheter flowmeter, 2599
 - averaging, blood flowmetry, dynamic calibration, 2943
 - blood flowmetry, zero offset, 2922
 - catheter flowmeter, 1381
- electromagnetic radiation**, amplifier, bolometer, signal noise ratio, 2147
 - antenna, telemetry, beam profile, yagi antenna, 3586
 - artificial heart pacemaker, heart arrhythmia, tachycardia, radiofrequency pacemakers, 3690
 - body temperature, pressure measurement, telemetry, fish, 968
 - body temperature, heart rate, hibernation, telemetry, squirrel, 967
 - brain, brain cortex, copper, hypothalamus, iron, magnesium, potassium, sodium, zinc, 1600 mhz, rat, 2564
 - brain, capacitance transducer, intracranial pressure, pressure transducer, telemetry, epidural implantation, 971
 - cell membrane, microwave radiation, thermodynamics, non thermal effects, 1833
 - diathermy, electromagnetic field, hyperthermia, microwave radiation, physiotherapy, 2178
 - diathermy, physiotherapy, radiation absorption, penetration depth, 1909
 - dielectric constant, electric field, muscle, 2851
 - dielectric constant, microwave radiation, 1810
 - electrocardiography, signal noise ratio, telemetry, los angeles, 1359
 - electroencephalography, psychiatry, telemetry, 972
 - electromagnetic field, environment, radiation absorption, radiation hazard, 584
 - electron spin resonance, generator, nuclear magnetic resonance, marginal oscillator, 1415
 - emergency, telemetry, usa, 973
 - eye, magnetic field, radiation injury, retina, rat, ultrastructure, 254
 - heating, microwave radiation, thyroid gland, thyroxine, triiodothyroxine, dog, 2566
 - industrial medicine, microwave radiation, occupational health, radiation hazard, 3659
 - intracranial pressure, monitoring, telemetry, temperature, 1361

- mathematic model, radiation absorption, man, animal, 2567
- microwave radiation, neurotransmitter, receiver, telemetry, 183
- model, radiation absorption, induced electromagnetic field, 2275
- radiation absorption, trunk, 3714
- radiation absorption, thermography, 449
- radiometry, solar radiation, sunlight, 1814
- spectrometry, wave analyzer, 3580
- telemetry, usa, 974
- electrometer**, differential amplifier, ph measurement, 511
 - electronic switch, varicap, 3579
- electromyography**, above knee prosthesis, leg prosthesis, myoelectric control, leg controller, 2263
 - acceleration, back muscle, impact, dog, 715
 - alcoholism, amyotrophic lateral sclerosis, anterior tibial muscle, biceps brachii muscle, motoneuron disease, muscular dystrophy, polyneuropathy, muaps, automatic analysis, 14 controls, 11 cases, 857
 - alertness, computer, electroencephalography, rem sleep, sleep, telemetry, rat, automatic analysis, 2111
 - alertness, computer, electroencephalography, 5 hydroxytryptophan, levodopa, rem sleep, sleep spindle, stage 3 sleep, automatic classification, cat, 1620
 - algorithm, lip, speech, analysis, synthesis, manipulation, feature, 1985
 - amplifier, electroencephalography, interference, telemetry, powerline interference, 1362
 - amplifier, electrocardiography, electroencephalography, optoelectronic transducer, 2099
 - ankle, anterior tibial muscle, foot, gastrocnemius muscle, joint, rotation, soleus muscle, sinusoidal torque, human, 895
 - anxiety, biofeedback, epilepsy, insomnia, paralysis, spasticity, tension headache, clinical application, review, 1081
 - artificial heart pacemaker, diaphragm, bipolar demand pacemaker, inhibition by diaphragmatic myopotentials, 2195
 - audioamplifier, electroconvulsive therapy, muscle relaxation, 1500
 - automation, evoked muscle response, facial nerve paralysis, nerve stimulation, automatic electronic device, maximal stimulation test, 2759
 - aviation, electrocardiography, electroencephalography, respiration, skin conductance, inexpensive recording method, 296
 - behavior, head movement, neck muscle, photography, vision, 2638
 - biceps brachii muscle, muscle force, 1905
 - bicycle ergometry, muscle contraction, muscle load, special ergometer, human muscle, 3749
 - biofeedback, rehabilitation, toy, myodisplay instrument, child, 279
 - body posture, cerebral palsy, chair, ergonomics, sitting, method, 284
 - cerebral palsy, gait, hemiparesis, muscular dystrophy, telemetry, temporal information, 100 cases, 1904
 - cinematography, gait, telemetry, analysis method, daily orthopedic practice, 843
 - cinematography, synchronization, 946
 - computer, computer analysis, 3807
 - computer, intestine motility, intestine sound, computer analysis, rabbit, 3472
 - computer, electrocardiography, information processing, stationarity and normality test, 2326
 - computer, motor unit, muscle disease, neuropathy, spike, computer analysis, 26 subjects, 75 muscles, human, 1953
 - computer, monitoring, 711
 - computer, motor unit potential, tibialis anterior muscle, 4 subjects, automatic analysis, computer, 3427
 - computer, jaw, mastication, muscle contraction, man, 1613
 - computer, electrocardiography, ergonomics, error, exercise electrocardiography, heart rate, quality control, 1164
 - coordination, joint, locomotion, mathematic model, movement, human, 432
 - correlation function, larynx, speech, volunteer, 3217
 - denervation, motoneuron disease, neuropathy, automatic analysis, 1955
 - diagnosis, gait, locomotion, pattern recognition, 19 patients, 1906
 - disabled, information processing, prosthesis, signal processing, 1744
 - display system, extraocular muscle, muscle disease, neuropathy, spike, visual display, 704
 - echography, speech, ultrasonic transducer, new transducer, 3236
 - electrocardiography, electrode, static electricity, disturbance by exogenous static electricity, 1000
 - electrocardiography, electrode, electroencephalography, electrooculography, pasteless electrode, 158
 - electrocardiography, on line evaluation, emg elimination, 1057
 - electrocorticography, rem sleep, sleep, stage 3 sleep, rat, sleep stage, automation, 1995
 - electrode, electrode connectors, apparatus, 157
 - electrode, muscle, surface electrode, high pass filter technique, 2644
 - electrode, 1391

- electrode, electrodiagnosis, teflon failure, 2538
- electrode, multiple electrode, 2135
- electroencephalography, sleep, telemetry, rat, fm-am transmitter, 2110
- electroencephalography, electrooculography, information processing, sleep, multidimensional analysis, 1082
- fatigue, muscle strength, back muscle strength, shoulder arm strength, determination, apparatus, 1116
- fatigue, muscle performance, triceps surae muscle, total torque, weighted emg sum, man, 2029
- forearm, mathematic model, muscle, neuromuscular system, 2427
- frequency analysis, motor unit potential, spike, firing time statistics, spectral analysis, 2077
- frequency analysis, shape recognition, 3238
- gait, movement, telemetry, volunteer, 1769
- hip, ligament, mathematic model, forces evaluation, 437
- information processing, integrated emg, analysis method, human, 3426
- isometric muscle contraction, signal noise ratio, filtered emg, 1001
- mathematic model, spectrometry, 1754
- mathematic model, nonstationary model, 2085
- minicomputer, muscle isometric contraction, spike, 1954
- electron**, magnetic field, phantom, roentgen dose distribution, depth dose, 1419
- electron density**, atomic number, brain cyst, colloid cyst, computer assisted tomography, method, 12 cases, 2333
 - brain, brain edema, brain tumor, computer assisted tomography, tomochemical analysis, 2740
- electronic calculator**, braille, low vision, 4 types, 539
- electronic instrument**, cardiology, electric accident, medical engineering, 2591
 - electric accident, leakage tester, 2291
- electronic particle counting**, particle counter, 15-1000 mum in diameter, 3625
 - thrombocyte count, thrombocytopenia, 1939
- electronics**, air pollution, traffic, future development, 1476
 - hadamard transform, 31
- electronic switch**, electrometer, varicap, 3579
- electron microscopy**, calcification, calcium blood level, scanning electron microscopy, serum, 204
 - diffusion, scanning electron microscopy, heavy atoms, 982
 - digital computer, display system, image processing, 3 d display, 2498
 - electric interference, magnetic field, scanning microscopy, ac field compensation, 129
 - erythrocyte, pattern recognition, 2017
 - freeze drying, microscope slide, critical point drying, 3224
 - freeze etching, microphotometry, microscope slide, 3223
 - lens, magnetic lens, rotation free lens, 3600
 - magnetic field, magnetic lens, power supply, drift reduction, 1779
 - oscilloscope, sampling, scanning electron microscopy, 3594
 - power supply, voltage stabilizer, voltmeter, 981
 - resolving power, astigmatism control, 3222
 - sample holder, philips em 300s, 2874
 - scanning electron microscopy, specimen, surface variation, 1364
 - scanning electron microscopy, stage control, 133
 - scanning electron microscopy, signal noise ratio, 2513
 - scanning electron microscopy, specimen holder, etec corporation, cyclic loading, 3593
 - scanning electron microscopy, alignment, 2502
 - scanning electron microscopy, signal noise ratio, channel plate multiplier, 1783
 - scanning electron microscopy, resolving power, 1775
 - high voltage e.m., 10.000 kv. e.m., description, use, 2497
 - philips em300, beam tilt device, diffraction measurement, 125
- electron probe**, eye foreign body, eye injury, foreign body localization, perforating eye injury, roentgen analysis, case report, technique, 2255
- electron probe microanalysis**, fast proton radiation, trace element, 3564
- electron spin resonance**, bone, crystal, radiation injury, random orientation, 187
 - cryogenics, spectrometry, 3.7 k, 181
 - electromagnetic radiation, generator, nuclear magnetic resonance, marginal oscillator, 1415
 - spectrometry, aqueous solution, 581
- electron transport**, chlorophyll, cytochrome, infrared radiation, spectrometry, electron tunneling, 180
 - deoxyribonucleic acid, fast electron radiation, ice, 3204
 - ion transport, membrane permeability, membrane potential, 392
- electronystagmography**, caloric vestibular test, electrooculography, apparatus, 252
 - computer, nystagmus, data processing, 1163
 - mathematic model, nystagmus, vestibuloocular reflex, physiological vs pathological conditions, 3135
 - microprocessor, optokinetic nystagmus, vestibular nystagmus, 2000

- vestibulometry, laboratory device, 255
- electrooculography**, biometry, eye, ultrasonics, new device, technique, measurement, axial length, 2987
 - caloric vestibular test, electronystagmography, apparatus, 252
 - electrocardiography, electrode, electroencephalography, electromyography, pasteless electrode, 158
 - electroencephalography, epilepsy, sleep, telemetry, videorecording, automatic analysis, visual analysis, video recording, closed circuit, 1884
 - electroencephalography, electromyography, information processing, sleep, multidimensional analysis, 1082
 - static perimetry, visual field, automatic perimetry, 1566
- electrophoresis**, aminoacid, chromatography, skin, thin layer chromatography, urea, method, device, 3746
 - electric field, microelectrophoresis, alternating field, 609
 - protein, high resolution electrophoresis system, human serum, 499
- electrophysiology**, electric interference, monitoring, 2964
 - information processing, nonlinear system, 3124
- electroretinography**, b potential, evoked visual response, skin electrode, normal subjects, 3357
 - cornea, c potential, electrode, retina, sclera, rabbit, 557
 - electrode, new device, 267
 - electroencephalography, microelectrode, nerve cell potential, oxygen electrode, platinum electrode, double barrelled electrode, simultaneous measurement, 2142
 - electroretinography critical flicker fusion, retina cone, masking, de lange curve, tree shrew, 3190
 - light, light intensity, photostimulation, an instrument for standardization, 2252
 - light, retina, temperature, combined sensor, 1519
 - soft contact lens, dc recording, human, 1522
- electroretinography critical flicker fusion**, electroretinography, retina cone, masking, de lange curve, tree shrew, 3190
- electrosleep**, brain depth stimulation, electroencephalography, sleep, stimulation, need activation, artificial sleep, 1499
- electrostatic charge**, anesthesia, body, explosion hazard, capacitance measurement, human body, 1390
- electrostimulation**, acoustic nerve, cochlea, electrode, scala tympani, nerve survival, stimulation pattern, cat, 3339
 - artificial heart pacemaker, electrode, endocardial pacing, heart, rate of electrode displacement, 1050
 - bladder pacemaker, urine incontinence, 2958
 - bladder sphincter, stress incontinence, urethra pressure, urine incontinence, 40 patients, 664
 - brain depth stimulation, implantation, power supply, lateral hypothalamus, constant current, rat, 3332
 - brain depth stimulation, implant, platinum electrode, electrode area, 2086
 - brain depth stimulation, corrosion, needle electrode, nervous system, biphasic stimulation, 2228
 - cerebral palsy, hemiplegia, movement, orthosis, paralysis, actual situation, problem, 713
 - computer, heart muscle, heart muscle potential, heart ventricle, 860
 - electrode, nervous system, platinum electrode, electrochemical reaction, 1490
 - feedback system, median nerve, perception, prosthesis, 2262
 - ileum, intestine, stimulation device, rat, mechanical stimulation, 2179
 - middle ear, reflex time, tensor tympani muscle, tongue, bipolar electric stimulation, device, 1506
 - minicomputer, neuromuscular disease, orthosis, peroneus nerve paralysis, design methodology, 1239
 - pain, pain threshold, apparatus, 22 volunteers, pain tolerance, skin stimulation, 1488
 - tactile discrimination, stimulus properties, volunteers, 714
- electrostimulator**, artifact reduction, iontophoresis, electrooptic coupler, 1070
 - blindness, deafness, display system, touch, 2981
 - cell membrane, constant current stimulator, membrane potential, nervous system, current rectification, resistance measurement, 1491
 - cranial nerve, electrode, nerve stimulation, pons angle, apparatus, 678
 - implant, nervous system, 2626
 - pain, skin, skin defect, 694
 - pulse generator, modification grass sd9, 2103
 - sweep generator, transient response, frequency response, sine wave stimulator, 2976
 - waveform generator, trapezoid generator, 2489
- electrosurgery**, cancer surgery, electrode, new instruments, 2681
- ellipsometer**, photometry, photomultiplier, polarimetry, linearization, drift stabilization, 3650
- embedding**, araldite, hair, cross sectioning, 294
- embolism**, angiocardiology, catheter, heart catheterization, thrombosis, pigtail catheter, different sideholes numbers, catheter comparison, 3754
 - aphasia, brain infarction, computer assisted tomography, medial brain artery, stroke, 60 cases, 1195
 - artificial heart pacemaker, electrode, lung embolism, catheter embolism, migrating of retained pacemaker, 1479
 - heart valve prosthesis, thrombosis, quest for perfect valve, 1458
- embolism prevention**, heel, postoperative complication, support, thrombosis prevention, heel support device,

- embryo**, cell membrane permeability, heart atrium, heart muscle, heart muscle contraction, electrical stimulus changes, chicken, 2411
 - heart muscle fiber, membrane potential, microelectrode, signal noise ratio, intercellular communication, 1742
- embryogenesis**, anatomy, cell structure, gastrulation, mathematic model, tissue, 3510
- embryo motility**, cell motion, computer model, engulfment, 3317
- emergency**, airplane pilot, ejection seat, mathematic model, model, body model, windblast force, aerodynamic force, articulated human body, emergency ejection, 2648
 - ambulance, heart infarction, life support system, telemetry, 3292
 - blood, lung blood flow, lung insufficiency, microfilter, filtration rationale, 3280
 - electromagnetic radiation, telemetry, usa, 973
- emergency health service**, ambulance, helicopter, rescue personnel, german federal republic, equipment, 5 yrs experience, ulm, 3569
- emergency ward**, computer, computer program, information processing, model, statistics, deterministic simulation model, data reconstruction, 2686
 - coronary care unit, electric accident, hospital, intensive care, labor room, operating room, recovery room, safety, maryland lutheran hospital, 502
- beta emitter**, autoradiography, scanning electron microscopy, location of beta emitter, 1017
- emmetropia**, eye fundus, eye model, completing gullstrand eye, 2044
- emotional disorder**, computer, interview, personal relevance, 3418
- empty sella syndrome**, computer assisted tomography, 26 cases, 804
- empyema**, brain abscess, computer assisted tomography, epidural space, subdural empyema, 15 patients, 3438
- encephalitis**, brain abscess, brain hemorrhage, brain infarction, brain tumor, computer assisted tomography, meningitis, 80 children, 3462
 - brain abscess, brain angiography, brain scintigraphy, computer assisted tomography, case, 377
 - brain atrophy, central nervous system metastasis, computer assisted tomography, electroencephalography, epilepsy, partial epilepsy, tonic clonic epilepsy, 99 cases, 829
- encephalopathy**, accelerometer, ataxia, tremor, triaxial accelerometer, 3334
 - ammonium, aspartate aminotransferase blood level, brain edema, computer, electroencephalography, exchange blood transfusion, fatty liver, furosemide, mannitol, reye syndrome, 7 children, 779
 - brain abscess, computer assisted tomography, density, glioblastoma, measurement of mean density, 798
 - computer assisted tomography, creutzfeldt jakob disease, slow virus disease, 2 cases, 1603
- endobronchial intubation**, anesthetic equipment, white tube modification, 2950
- endocardial electrode**, artificial heart pacemaker, electrode, low threshold endocardial electrode, 642
- endocardial pacing**, artificial heart pacemaker, electrode, electrostimulation, heart, rate of electrode displacement, 1050
- endocardium**, electrocardiography, heart stimulation, stimulation threshold, amplitude unipolar endocardial electrogram, 2595
- endometrium carcinoma**, cell nucleus, computer analysis, endometrium hyperplasia, pattern recognition, quantitative microscopy, 2956
- endometrium hyperplasia**, cell nucleus, computer analysis, endometrium carcinoma, pattern recognition, quantitative microscopy, 2956
- endoneurium pressure**, capsule, interstitial fluid, lead, nerve fiber, polyethylene, sciatic nerve, rat, 151
- endoprosthesis**, biomechanics, femur, biomechanics of stress and strain, 3740
 - bone cement, joint capsule, joint total replacement, macrophage, methacrylic acid methyl ester, wear product reaction, 1110
 - metal prosthesis, temperature, ultrasonics, rabbit, 191
- beta endorphin**, gating circuit, iontophoresis, naloxone, accurate current monitoring system, 3209
- endoscopic retrograde cholangiopancreatography**, computer assisted tomography, kidney disease, liver disease, liver scintiscanning, pancreas disease, retroperitoneal disease, tomography, 359
- endoscopy**, aneurysm, hypophysis adenoma, lumbar disk, sella turcica, telescope, endoscopy, apparatus, neurosurgery, hopkins telescope, 666
 - biliary tract, common bile duct, choledochofiberscope, 200 patients, diagnosis, 3275
 - cerebellomedullary cistern, pons angle, pterygoid fossa, apparatus description, 3273
 - cholelithiasis, common bile duct, gallstone, lithotripsy, 1036
 - colon disease, sigmoidoscopy, 139 patients, diagnosis, flexible versus rigid sigmoidoscope, 1033
 - esophagus foreign body, fiberoscope, foreign body extraction, gastrointestinal tract, stomach, special snare, coins, children, adults, 1034
 - foreign body, storz hopkins system, child, infant, 3338
 - prostate biopsy, punch biopsy, cold punch device, 1143
- endothelium cell**, cell membrane, mathematic model, pinocytosis, vesicular transport, 18
- endotracheal intubation**, airway obstruction, pollard tube, 2 cases, 324
 - anesthesia, rabbit intubation, improved method, 3305

- artificial ventilation, esophagus, resuscitation, esophagus obturator, 2935
- cuff, trachea injury, tracheotomy tube, comparison of 5 types, dog, 3310
- blade, 2608
- endplate potential**, calcium, magnesium, mathematic model, neuromuscular synapse, non linear summation, martin formula, frog, 3196
- mathematic model, postsynaptic membrane, postsynaptic potential, 1321
- end tidal carbon dioxide tension**, capnography, monitoring, 3396
- computer, functional residual capacity, intensive care, lung function test, mass spectrometry, monitoring, 2675
- end tidal oxygen, capnostat, oxystat, electronic constant maintain device, 3162
- end tidal oxygen**, end tidal carbon dioxide tension, capnostat, oxystat, electronic constant maintain device, 3162
- energy**, muscle performance, running, walking, work, level walking, 1121
- energy consumption**, climate, environment, 2577
- energy expenditure**, breathing, energy transfer, oxygen consumption, mathematic model, calculation, 3681
- energy resource**, environmental health, sun, power consumption, power generation, 1437
- energy transfer**, adenosine triphosphatase, adenosine triphosphate, mathematic model, 3495
- breathing, energy expenditure, oxygen consumption, mathematic model, calculation, 3681
- calorimetry, oxygen consumption, 24 hrs, direct and indirect measurement, 3635
- computer model, glucose, glycolysis, heart muscle, heart perfusion, nicotinamide adenine dinucleotide, reduced nicotinamide adenine dinucleotide, rat, 1631
- heart work, mathematic model, thermodynamics, 1678
- mathematic model, motor unit, neuromuscular system, energy optimal control, 1722
- skin, masking, human, 3747
- entropy**, airway, airway resistance, bronchus tree, lung vascular resistance, mathematic model, respiration, morphology, branching tree, 434
- enuresis**, alarm monitoring, inexpensive low current circuit, 3321
- environment**, air pollution, model, pollution monitoring, 2955
- air pollution, infrared radiation, light absorption, spectrometry, 2150
- air pollution, ethylene, lidar, 2612
- air pollution, information processing, lidar signal, 2578
- air pollution, laser, monitoring, digital system, 1480
- air pollution, atmosphere, microwave radiation, sulfur dioxide, 1873
- anemometry, hot wire, calibration, 3624
- atmosphere, scintillation, mechanism, turbulence, 16
- atmosphere, scintillation, 171
- auditory stress, ear trauma, hearing, microphone, sound level measurement, conga microphone, 1019
- climate, energy consumption, 2577
- collimator, solar cell, solar energy, spectrometry, 2558
- corn, germination, microwave radiation, 2152
- dust, smoke, electrostatic precipitator, precipitator, review, 3715
- electric field, magnetic field, high voltage transmission line, biological hazard, 2092
- electric field, magnetic field, mathematic model, ultra high voltage line, biological hazard, 2091
- electromagnetic field, electromagnetic radiation, radiation absorption, radiation hazard, 584
- mathematic model, despatch strategy, power generator, power consumption, 1439
- microwave radiation, occupational health, radar, radiation hazard, radiation sources, 3660
- model, noise generator, noise pollution, spectrometry, traffic, 1426
- nuclear waste, soil pollution, 2394
- oxygen, water pollution, 1652
- photoelectric cell, solar energy, 3505
- population model, markov model, fibonacci phyllotaxis, 2763
- power, solar energy, greenhouse effect, 146
- psychrometer, thermocouple, automatic scanning, 608
- recording, thermistor, thermometer, water quality, 1799
- resistance, soil, soil resistivity measurement, 2890
- solar cell, 2559
- telemetry, water pollution, water depth, bottom feature, 2494
- waste water, water pollution, instrumentation, reliability, 2169
- water pollution, instrumentation review, 3267
- human judgment, 3507
- environmental contamination**, carbon 14, nuclear power plant, population exposure, radioactivity, c 14 production, 1334
- environmental health**, energy resource, sun, power consumption, power generation, 1437
- environmental monitoring**, air, occupational exposure, radioactive contamination, radon 222 daughter,

- workroom air, working level, 2904
- ionization chamber, nuclear reactor, population exposure, thermoluminescence dosimeter, vermont yankee nuclear power station, 1335
- liquid chromatography, water pollution, water quality, 1028
- radioactive contamination, uranium mine, water system, uranium milling, new mexico, 1336
- thermoluminescence dosimeter, internal background build up measurement, 1422
- environmental pollution**, echo, sound level measurement, free field measurement, enclosure, 193
- environmental sanitation**, annoyance, community, loudness, noise, perception, pollution, loudness scaling, 256
- enzyme**, antigen protein, chemical kinetics, ribonuclease, ribonucleic acid, ultrasonics, ultrasonic cavitation, 203
 - bioavailability, blood cell aggregation, drug clearance, drug metabolism, drug protein binding, liver blood flow, mathematic model, pharmacokinetics, review, 3108
 - brain, homoprotocatechuic acid, microwave radiation, radiation hazard, rat, 3628
 - chemical kinetics, computer model, multiple pathway reaction, 1254
 - cryostate, photometry, spectrometry, 2506
 - mathematic model, hypercycle model, 1253
- enzyme inhibition**, automation, cholinesterase, information processing, stop flow technique, inhibition constant, 1151
- enzyme kinetics**, chemical kinetics, mathematic model, 413
 - clinical chemistry, digital computer, photometry, spectrometry, zeiss prp, 753
- ependyma**, brain edema, brain ventricle, cerebrospinal fluid, computer assisted tomography, hydrocephalus, 4 patients, transependymal csf absorption, 2736
- ependymoma**, brain angiography, brain tumor, cerebellum tumor, computer assisted tomography, hemangioblastoma, medulloblastoma, 22 children, 3455
- epidemic**, computer, diagnosis, documentation, pharmacotherapy, 2329
 - diarrhea, mathematic model, pattern recognition, 139 infants, 2781
 - disease carrier, mathematic model, threshold theorem, 2779
 - inactivated virus vaccine, influenza a, influenza virus a, mathematic model, stochastic model, vaccination, 3499
 - mathematic model, 1255
- epidemiology**, adverse drug reaction, drug monitoring, mathematic model, pattern recognition, pharmacokinetics, public health, 1956
 - age, breast cancer, cancer incidence, cancerogenesis, menarche, menopause, stochastic model, 2768
 - computer, information processing, mathematic model, 339
 - cost, immunization, mathematic model, model, statistics, 3509
 - cost, immunization, mathematic model, 3508
 - data base, 3041
 - mathematic model, spatial spread, kendall's pandemic threshold theorem, 2004
 - medical education, public health school, research, united states, three dimensional model, 2389
 - model, mortality, population model, statistics, competition, prey predator, 2785
- epidermis**, biophysics, skin, thermodynamics, nondestructive measurement, 3151
 - cesium 137, diffusion, skin permeability, strontium 89, role, 292
 - computer model, skin permeability, sodium, frog, 870
 - skin, slices, comparative thickness, weight, rat skin, 293
- epidermis horny layer**, adhesive agent, transparency, transparency patterns, adhesive tape strip series, apparatus, 3006
- epidermoid tumor**, brain tumor, computer assisted tomography, 2 cases, 364
- epidural abscess**, brain angiography, brain falx, computer assisted tomography, otitis media, subdural empyema, 11 yr old girl, neurosurgery, interhemispheric localization, 3062
- epidural hematoma**, computer assisted tomography, subdural hematoma, 30 patients, 3434
- epidural hemorrhage**, brain hemorrhage, computer assisted tomography, subdural hematoma, attenuation value, 14 cases, 800
- epidural space**, brain abscess, computer assisted tomography, empyema, subdural empyema, 15 patients, 3438
- epilepsy**, algorithm, electroencephalography, analysis, 347
 - anxiety, biofeedback, electromyography, insomnia, paralysis, spasticity, tension headache, clinical application, review, 1081
 - brain atrophy, computer assisted tomography, electroencephalography, head trauma, traumatic epilepsy, 78.070.297.P cases, 2330
 - brain atrophy, central nervous system metastasis, computer assisted tomography, electroencephalography, encephalitis, partial epilepsy, tonic clonic epilepsy, 99 cases, 829
 - computer assisted tomography, cost benefit analysis, diagnosis, headache, temporal lobe epilepsy, 107 cases, u.s.a., 1209
 - electrode, electroencephalography, telemetry, telephone telemetry, 975
 - electroencephalography, electrooculography, sleep, telemetry, videorecording, automatic analysis, visual analysis, video recording, closed circuit, 1884

- electroencephalography, telemetry, paroxysmal activity, 2868
- electroencephalography, multichannel recorder, tape recorder, telemetry, 27 days recording, 976
- electroencephalography, 10 cases, automated detection, 1721
- electroencephalography, excitatory postsynaptic potential, feedback system, filter, inhibitory postsynaptic potential, model, nerve cell network, neuron population, 3548
- face injury, helmet, protective head gear, 1111
- information processing, 335
- epileptic focus**, automation, electroencephalography, spike, autoregressive filter model, 4 patients, spike and wave, 1946
- epiphora**, blindness, computer assisted tomography, exophthalmos, headache, mucocoele, ophthalmoplegia, paranasal sinus, ptosis, 4 cases, 2737
- epithelial cell**, cell membrane permeability, hydrostatic pressure, kidney tubule, osmotic pressure, 387
 - cell membrane permeability, mathematic model, thermodynamics, tracer flux ratio, 896
 - cell membrane permeability, compartment model, electrolyte, mathematic model, weak electrolyte, 20
- epithelium**, bladder wall permeability, skin permeability, xenon 133, in vitro, water boundary layer, frog, 2012
 - cell membrane potential, differential amplifier, signal noise ratio, 2886
 - electric model, model, sodium, sodium pump, 2395
 - intestine mucosa, intestine potential, intestine serosa, osmotic pressure, asymmetrical behavior, rat, 1441
- equation**, diffusion, ecology, migration, nonlinear system, population model, differential equation, multispecies model, stability, 876
 - gas bubble, lung diffusion, neon, nitrogen, oxygen, respiration, counter diffusion, 2051
- ergonomics**, accident, industry, accident theory, study in 15 industries, finland, 2265
 - aircraft, automation, aviation, u.k., 3039
 - bioengineering, industry, occupational health, work environment, manual labor, uk, overview, 2653
 - body posture, cerebral palsy, chair, electromyography, sitting, method, 284
 - camera, tilting, tremor, 2131
 - computer, electrocardiography, electromyography, error, exercise electrocardiography, heart rate, quality control, 1164
 - model, spine, human spine, torso, head, three-dimensional model, 2425
- error**, computer, electrocardiography, electromyography, ergonomics, exercise electrocardiography, heart rate, quality control, 1164
- erythema**, erythropoietic porphyria, light reactivity, minimum erythema dose, photochemotherapy, phototest, ultraviolet radiation, new apparatus, application, 3651
- erythrocyte**, acoustic impedance, kidney, liver, muscle, sound velocity, tissue, ultrasonics, viscosity, shear acoustic impedance, 58
 - adenosine triphosphate, glycolysis, mathematic model, human erythrocyte, 3116
 - artificial kidney, dialysis membrane, leukocyte, thrombocyte, blood component deposited, electron microscopy, 621
 - blood, mathematic model, sound, erythrocyte shape and propagation, 2821
 - blood, electrolyte balance, magnetic field, plasma, potassium, sodium, rat, 1243
 - blood cell count, laser, leukocyte, thrombocyte, laser beam optics, hemac 6301, 570
 - blood flow, oxygen consumption, tube, turbulent flow, 1702
 - capillary, capillary flow, mathematic model, oxygen transport, 461
 - cell diameter, laser, light diffraction, microscopy, 2182
 - cell structure, centrifuge, erythrocyte deformation, microscopy, human, 3278
 - conductivity, mathematic model, erythrocyte size, 3556
 - elasticity, erythrocyte membrane, elastic deformation, 891
 - electron microscopy, pattern recognition, 2017
 - erythrocyte membrane, mathematic model, spectrin, human, 2423
 - hematocrit, erythrocyte flow, tube flow, narrow tube, 2055
 - mathematic model, static equilibrium configuration, 1700
- erythrocyte deformability**, blood rheology, micropipette, electronic flow measurement, tube flow, 472
- erythrocyte membrane**, blood disease, cell membrane, erythrocyte osmotic fragility, statistics, osmotic fragility curve, 2180
 - cell membrane permeability, naphthalene sulfonate derivative, thermodynamics, 3152
 - cell volume, elasticity, viscosity, human, 215
 - elasticity, nystatin, elastic area, compressibility, 2797
 - elasticity, erythrocyte, elastic deformation, 891
 - erythrocyte, mathematic model, spectrin, human, 2423
 - protein, raman spectrum measurement, extraction, raman spectrum, 3121
- erythrocyte osmotic fragility**, blood disease, cell membrane, erythrocyte membrane, statistics, osmotic fragility curve, 2180
- erythrocyte sedimentation rate**, blood viscosity, semi empirical approach, 623
 - compartment model, characteristic, 627

- computer, deoxyguanosine phosphate, free radical, gamma radiation, computer analysis of esr spectrum, 2343
- controlled shear rate, 624
- erythropoietic porphyria**, erythema, light reactivity, minimum erythema dose, photochemotherapy, phototest, ultraviolet radiation, new apparatus, application, 3651
- erythropoietin**, hypobaric chamber, hypoxia, 1349
- erythrosis**, cyclohexane, fluorescence, gamma counting, 1402
- escherichia coli**, catalase, respiration, superoxide dismutase, ultraviolet radiation, continuous flow system, 1344
 - chemoreceptor, chemotaxis, pheromone, physics, 2009
- esophagography**, computer, esophagus pressure, 25 cases, 3470
- esophagus**, artificial ventilation, endotracheal intubation, resuscitation, esophagus obturator, 2935
 - computer assisted tomography, ureter, 200 cases, 3844
 - foreign body, magnet, nasogastric tube, stomach, magnetic removal, 613
- esophagus achalasia**, esophagus peristalsis, esophagus pressure, gastrointestinal motility, gastrointestinal tract, pressure transducer, scleroderma, 1351
- esophagus foreign body**, endoscopy, fiberoscope, foreign body extraction, gastrointestinal tract, stomach, special snare, coins, children, adults, 1034
- esophagus peristalsis**, esophagus achalasia, esophagus pressure, gastrointestinal motility, gastrointestinal tract, pressure transducer, scleroderma, 1351
 - esophagus pressure, pressure transducer, pressure transducer, human, 3570
- esophagus ph**, gastroesophageal reflux, ph electrode, stomach acid, automatic analysis, 1836
- esophagus pressure**, breathing, catheter, catheter choosing, 3270
 - computer, esophagography, 25 cases, 3470
 - esophagus achalasia, esophagus peristalsis, gastrointestinal motility, gastrointestinal tract, pressure transducer, scleroderma, 1351
 - esophagus peristalsis, pressure transducer, pressure transducer, human, 3570
- estrogen therapy**, cell kinetics, cell proliferation, hormone, population model, mice, 2406
- estrus**, abdominal viscera, camera, implantation, solid state camera, sheep, 1782
- etching agent**, glass electrode, hydrofluoric acid, micropipette, tip etching, 2539
 - metal, microelectrode, electronic control, 996
- ethanol**, circadian rhythm, computer model, fluid intake, mouse, 400
- ethylene**, air pollution, environment, lidar, 2612
- ethylene glycol**, lipid membrane, membrane potential, bilayer membrane, 3177
- evaporation**, burn, heat radiation, mathematic model, skin, temperature distribution, 2040
 - carbon dioxide, oxygen consumption, respiration quotient, water loss, water loss measurement, bird, lizard, 206
 - hygrometer, water loss, dew point hygrometry, pigeon, 2174
- evoked acoustic nerve response**, audiometry, auditory masking, cochleography, meniere disease, sudden deafness, tuning curve, 2443
 - computer, evoked response audiometry, electric response audiometry, normal values, 3853
 - computer assisted tomography, olivopontocerebellar atrophy, 3 cases, method, 3820
 - evoked brain stem response, high pass filter, tone burst, response amplitude, 3323
 - evoked response audiometry, on line detection, 2621
 - pitch, spectroscopy, frequency following response, harmonics, 2979
- evoked brain stem response**, evoked acoustic nerve response, high pass filter, tone burst, response amplitude, 3323
- evoked cortical response**, alpha rhythm, averaging, evoked visual response, alpha removal, 1998
 - aphasia, automation, localization method, 3104
 - auditory system, computer model, signal noise ratio, human, 3483
 - computer, latent period, digital display, 1618
 - dyslexia, electrocardiography, evoked visual response, analyses automation, 1879
 - electroencephalography, evoked lateral geniculate response, information processing, mathematic model, cat, 89
 - electroencephalography, vagus nerve, nerve stimulation, cat, 2972
 - evoked visual response, telemetry, miniature system, rat, 530
 - evoked visual response, perimetry, limitation, 3734
 - evoked visual response, ophthalmoscopy, retina macula degeneration, retina pigment degeneration, stroboscopy, retina macula scar, stimulator ophthalmoscope, 47 patients, 2620
 - evoked visual response, hysteresis, mathematic model, photostimulation, 2464
 - latent period, reaction time, p 300, stimulus evaluation time, chronometry, 1882
 - orbital cortex, splanchnic nerve, tibial nerve, vagus nerve, nerve stimulation, cat, 2973
- evoked lateral geniculate response**, electroencephalography, evoked cortical response, information processing, mathematic model, cat, 89
- evoked muscle response**, automation, electromyography, facial nerve paralysis, nerve stimulation, automatic

- electronic device, maximal stimulation test, 2759
- evoked response**, averaging, digital computer, digital filtering, electroencephalography, evoked visual response model, 3727
 - averaging, mathematic model, wiener filter, wiener filter vs averaging, 2229
 - correlation function, electroencephalography, information processing, 1948
 - digital filtering, fourier transform, mathematic model, 1750
 - electroencephalography, signal processing, spectrometry, wave, 1740
 - electroencephalography, preamplifier, signal noise ratio, 1891
 - electroencephalography, statistics, filter evaluation, 1083
 - wiener filtering method, 2134
 - mathematical analysis, 90
- evoked response audiometry**, artifact reduction, on line artefact rejection, active analog delay line, method, 2888
 - auditory system, electrode, suction pressure electrodes, 695
 - automation, computer, electroencephalography, 855
 - brain stem, young children, 271
 - cochleography, mathematic model, method, frequency specific information, 3528
 - computer, evoked acoustic nerve response, electric response audiometry, normal values, 3853
 - evoked acoustic nerve response, on line detection, 2621
 - evoked somatosensory response, tape recorder, 675
- evoked somatosensory response**, computer assisted tomography, electroencephalography, stroke, human, 2335
 - electroencephalography, multiple sclerosis, 1748
 - evoked response audiometry, tape recorder, 675
- evoked visual response**, alpha rhythm, averaging, evoked cortical response, alpha removal, 1998
 - astrocytoma, computer assisted tomography, corpus callosum tumor, occipital cortex, optic radiation, 511
 - yr old man, necropsy, histopathology, 3724
 - averaging, digital computer, digital filtering, electroencephalography, evoked response, model, 3727
 - b potential, electroretinography, skin electrode, normal subjects, 3357
 - checkerboard, television, pattern generator device, 242
 - dyslexia, electrocardiography, evoked cortical response, analyses automation, 1879
 - evoked cortical response, telemetry, miniature system, rat, 530
 - evoked cortical response, perimetry, limitation, 3734
 - evoked cortical response, ophthalmoscopy, retina macula degeneration, retina pigment degeneration, stroboscopy, retina macula scar, stimulator ophthalmoscope, 47 patients, 2620
 - evoked cortical response, hysteresis, mathematic model, photostimulation, 2464
 - focal illumination, ophthalmoscopy, retina, retina illumination, hand-held and two channel stimulator, new device, 2244
 - information processing, latent period, 1950
 - high frequency component, power spectrum, 3325
- evolution**, beta radiation, radioactivity, optical purity, 2850
 - chemical kinetics, computer model, life, mathematic model, prokaryotic cell, 2774
 - life, magnetic field, 3110
 - population model, asymmetry, 2789
- exchange blood transfusion**, ammonium, aspartate aminotransferase blood level, brain edema, computer, electroencephalography, encephalopathy, fatty liver, furosemide, mannitol, reye syndrome, 7 children, 779
- excitability**, drowsiness, electricity, fatigue, headache, nausea, worker, high voltage field, environmental effects, 3106
- excitable membrane**, dipole theory, gating circuit, ion channel, 3178
 - hodgekin huxley equation, impedance, membrane impedance, 2839
 - lipid membrane, membrane potential, nerve fiber membrane, 394
 - lipid membrane, membrane permeability, nerve fiber membrane, potassium, sodium, didactic presentation, 393
 - model, excitation mechanism, 388
- excitation**, movement, nerve fiber potential, 490
- excitation contraction coupling**, heart muscle contraction, stimulation rate, frog, 1673
 - heart papillary muscle, heart right ventricle, thermopile, metal film thermopile, rabbit, frog, 2600
- excitatory postsynaptic potential**, electroencephalography, epilepsy, feedback system, filter, inhibitory postsynaptic potential, model, nerve cell network, neuron population, 3548
 - granular cell, hippocampus, information science, prediction of information theory, 2082
 - inhibitory postsynaptic potential, mathematic model, nerve cell, stochastic model, automation model, 2466
 - mathematic model, nerve cell potential, spike, interspike time distribution, 2849
- exercise**, balneology, duodenum ulcer, heart rate, kinesiotherapy, telemetry, czechoslovakia, 522
 - bicycle ergometry, muscle performance, crank force, one or two leg cycling, 443
 - blood pressure, telemetry, 528

- blood pressure, heart rate, heart work, oxygen consumption, rest, automatic measurement, 2753
- blood pressure, monitoring, sphygmomanometry, semiautomatic monitoring, electronic sphygmomanometer, 2186
- carbon dioxide, diving, dyspnea, functional residual capacity, helium, hyperbarism, lung volume, 49.5 ata, 6 divers, 1298
- computer, electrocardiography, heart rate, lung function, oxygen consumption, tidal volume, breath-by-breath respiratory measurements, 1615
- computer, digital computer, electrocardiography, thorax electric field, precordial isopotential map, 1235
- computer assisted tomography, echocardiography, heart catheterization, oxygen consumption, phonocardiography, invasive and noninvasive evaluation, human subject, 3416
- expiration, inspiration, mathematic model, respiration, 465
- gas exchange, heart output, oxygen consumption, output determination, 2201
- heart rate, pedometer, portable heartbeat integrator, rate distribution, children, adult, 1846
- mathematic model, muscle, muscle temperature, thermodynamics, thigh muscle, analytical solution, human, 2434
- exercise electrocardiography**, computer, electrocardiography, electromyography, ergonomics, error, heart rate, quality control, 1164
 - electrocardiography, electrode, hyperventilation, medical instrumentation, quality control, standards, task force, 3291
- exercise test**, computer, electrocardiography, ischemic heart disease, optimal measurement, 2698
 - computer, electrocardiography, heart rate, baseline estimation, 3422
- exophthalmos**, blindness, computer assisted tomography, epiphora, headache, mucocoele, ophthalmoplegia, paranasal sinus, ptosis, 4 cases, 2737
 - computer assisted tomography, hemangioma, meningioma, myositis, tumorous and nontumorous exophthalmos, 90 cases, 802
 - computer assisted tomography, eye foreign body, lens luxation, orbit tumor, retinoblastoma, 33 cases, 2742
 - computer assisted tomography, craniopharyngioma, hemianopia, orbit, subarachnoid cyst, boy of 7, 2738
 - echooculography, melanocytoma, optic nerve coloboma, retinoblastoma, vitreous body hemorrhage, new equipment, manual compound scanning, 1100
- experimental animal**, brain, perfusion, tissue fixation, simple apparatus, whole animals, rodents, brain fixation, pressure control, 1073
 - computer program, medical record, nonhuman primate, 2363
 - microphotography, microsurgery, surgical microscope, vascular surgery, 2 separately operated microscopes, foot pedal operated zoom, human surgery, adaptation possible, 327
- expiration**, air flow, analog computer, inspiration, integrator, lung volume, respiration, drift suppression, 2377
 - exercise, inspiration, mathematic model, respiration, 465
- explosion**, artificial heart pacemaker, battery, cremation, nuclear energy, mercury zinc batteries, lithium batteries, nuclear powered pacemakers, danger of explosion, britain, 2930
 - electric accident, operating room, survey, 102
- external ear**, audiometry, auditory threshold, hearing, free field audiometry, lateral vertical plane, 683
- external ear canal**, cochlea microphonic potential, electrode, ear canal electrode plug, children, 1104
- extracellular space**, ascorbic acid, brain, cerebrospinal fluid, computer, mannitol, pharmacokinetics, model, rabbit, 859
- extracorporeal circulation**, aorta surgery, aorta valve prosthesis, ascending aorta, blood flow, mitral valve prosthesis, flowmetry, 2207
 - artery counter pulsation, 3300
 - aspiration, heart surgery, automatic control device, 3704
 - blood filter, filter evaluation, 3281
 - blood gas, blood volume, calculation, calculation model sr-52, 3706
 - blood pump, heart lung machine, self regulating pump, 221
 - carbon dioxide, extrapulmonary oxygenation, lung ventilation, oxygenator, sheep, 322
 - device, pump, pulsatile pump system device, dog, 1469
 - gas embolism, nitrogen, oxygenator, possible contra indication, 1481
 - heart ball valve prosthesis, heart valve prosthesis, reflections, 1841
- extracorporeal oxygenation**, SEE extrapulmonary oxygenation
- extrafusil muscle fiber**, fusimotor muscle, mathematic model, muscle spindle, beta nerve fiber, chelonian spindle, 496
- extraocular muscle**, display system, electromyography, muscle disease, neuropathy, spike, visual display, 704
 - eye movement, oculomotor nerve, system analysis, saccadic eye movement, 883
- extrapulmonary oxygenation**, carbon dioxide, extracorporeal circulation, lung ventilation, oxygenator, sheep, 322
- extrapyramidal system**, acetylcholine, cholinergic system, computer model, dopamine, dopamine system, haloperidol, theoretical aspects, 3328

- extrasystole**, ectopic beat, electrocardiography, mathematic model, stochastic model, poisson process, 21 patients, 2196
- exudate**, bulla, histamine, inflammation, kinin, prostaglandin, skin, recovery, method, 3363
- eye**, acceleration, computer program, information processing, statistics, vestibular nystagmus, velocity, analog processing, cross correlation data analysis, 1497
- a scan, echography, digital display, instrumentation, method, 1091
 - biometry, electrooculography, ultrasonics, new device, technique, measurement, axial length, 2987
 - computer model, optics, geometrical optics, ray tracing, 1289
 - electromagnetic radiation, magnetic field, radiation injury, retina, rat, ultrastructure, 254
 - glaucoma, optic disk cup, stereophotography, fundus, 126
 - holography, method, instrumentation, long wave holography, optical holography, 1101
 - laser, retina lesion, vision, ocular hazard, monkey, 3637
 - temperature, temperature recording, measurements, rabbit, experimental and theoretical study, 2129
- eye foreign body**, computer assisted tomography, foreign body localization, orbit, perforating eye injury, 8 cases, 794
- computer assisted tomography, exophthalmos, lens luxation, orbit tumor, retinoblastoma, 33 cases, 2742
 - electron probe, eye injury, foreign body localization, perforating eye injury, roentgen analysis, case report, technique, 2255
 - magnet, pulsed magnet, extraction, 3401
- eye fundus**, emmetropia, eye model, completing gullstrand eye, 2044
- eye photography, fluorescein retina angiography, stereophotogrammetry, new device, 3587
 - eye photography, monochromatic light, ophthalmoscopy, normal fundus, 2635
 - indirect ophthalmoscopy, drawing teaching model, 686
- eye injury**, electron probe, eye foreign body, foreign body localization, perforating eye injury, roentgen analysis, case report, technique, 2255
- eyelid reconstruction**, facial nerve paralysis, magnet, ptosis, eyelid magnets, 276
- eye model**, emmetropia, eye fundus, completing gullstrand eye, 2044
- eye movement**, accident, car driving, vision, curve negotiation, 1120
- accommodation, retinoscopy, book retinoscopy, 1515
 - amblyopia, computer, strabismus, binocular vision, motility testing, 3485
 - body posture, computer, stabilography, visual stimulation, 275
 - brain tumor, malignant exophthalmos, muscle disease, myasthenia gravis, oculomotor paralysis, 118 cases, micromovement recording device, 270
 - computer, digital computer, signal processing, one line analysis, human, 1229
 - computer, rapid eye movement, saccadic eye movement, analysis, 3855
 - computer model, retina image, target, target point selection, 3 volunteers, 1698
 - cornea reflex, head movement, tilting, eye rotation, torsional movement, human, 446
 - echooculography, ultrasonic transducer, movement recording, 1804
 - electroencephalography, automatic elimination, 3103
 - extraocular muscle, oculomotor nerve, system analysis, saccadic eye movement, 883
 - feedback system, head movement, mathematic model, vision, eye head coordination, 1669
 - infrared radiation, optometry, eyetracking, 2637
 - mathematic model, nystagmus, saccadic eye movement, 2477
 - mathematic model, 665
- eye photography**, cataract, slit lamp photography, tomographic measurements, method, 3343
- eye fundus, fluorescein retina angiography, stereophotogrammetry, new device, 3587
 - eye fundus, monochromatic light, ophthalmoscopy, normal fundus, 2635
 - fiberoscope, ophthalmoscopy, transscleral illumination, 1093
- eye pulse**, blood pressure, carotid artery obstruction, echography, ultrasonics, no touch measurements, 1473
- eye surgery**, fiberoscope, lacrimal duct, lacrimal sac, device, 'pig tail' probe, 1094
- head rest, microsurgery, new device, 3354
 - illumination, microscopy, stereoscopic vision, new instrument, 3038
 - loupe, low vision, microsurgery, prism, visual aid, new device, 2295
 - microscopy, microsurgery, sterility, 2098
 - microsurgery, television, ceiling mounted unit, 3400
 - sclera, stiletto, sclera plug, new devices, 1553
 - sclera buckling procedure, silicone, stretcher, sponge implant, new device, 3397
 - surgical microscope, stable base, 1895
 - surgical microscope, eyepiece heaters, 752
- eye temperature**, light, mathematic model, retina, transient thermal response, 2039
- face**, computer, facial recognition, 2876
- computer assisted tomography, orbit, paranasal sinus, skull, coronal section, 35 cases, 2729

- computer assisted tomography, mucocoele, paranasal sinus, rhinopharynx cancer, skeleton, 1962
- computer assisted tomography, skull, tomography, 1580
- recognition, signal detection, vision, 28 volunteers, 3722
- face cancer**, computer assisted tomography, rhinopharynx cancer, skull base cancer, 50 cases, 3442
- face injury**, epilepsy, helmet, protective head gear, 1111
- facial nerve paralysis**, automation, electromyography, evoked muscle response, nerve stimulation, automatic electronic device, maximal stimulation test, 2759
- eyelid reconstruction, magnet, ptosis, eyelid magnets, 276
- factorial analysis**, algorithm, correlation function, parameter, matrix analysis, 3511
- fallout**, bone, strontium 90, yugoslavia, 1339
- family psychiatry**, correlation function, drug dependence, heroin, statistics, 3494
- fast electron radiation**, cobalt 60, dosimetry, lithium fluoride dosimeter, gamma radiation, radiotherapy, thermoluminescence, 1129
- deoxyribonucleic acid, electron transport, ice, 3204
- megavoltage radiotherapy, gamma radiation, thermoluminescence dosimeter, lif response, 1131
- megavoltage radiotherapy, radiation resistance, water air mass stopping power ratio, 3384
- thermoluminescence dosimeter, monte carlo calculation, 3375
- fast electron therapy**, collimator, display system, linear accelerator, megavoltage radiotherapy, collimator positioning device, 2659
- computer, dosimetry, decrement curve, 2722
- computer, radiation isodose distribution, treatment planning, 3065
- dosimetry, effect air space on depth dose, 3380
- radiation beam, scattering foil, field flattening, 3761
- roentgen dose distribution, magnetic enhancement, 3252
- roentgen dose distribution, thorax, small angle pendulous radiotherapy, 741
- fast neutron radiation**, beryllium, dosimetry, fast proton radiation, lithium, 2572
- beryllium, deuteron radiation, dosimetry, fast proton radiation, neutron generator, characterization of neutron beam, 2662
- cell culture, cyclotron, fibroblast, hemopoietic cell, leukemia cell, gamma radiation, relative biologic effectiveness, radiologic calibration program, hamster, human fibroblast, mouse, guinea pig, 2094
- cell survival, negative pion radiation, roentgen radiation, 3203
- collimator, radiation scattering, 3257
- collimator, neutron radiation, radiation scattering, 596
- cyclotron, radiation dose, physical characteristics, 2093
- deuteron radiation, fast particle radiation, fast proton radiation, lithium, neutron radiation, 3254
- dosimetry, fission neutron radiation, luminescence dosimeter, gamma radiation, 2159
- dosimetry, geiger mueller counter, ionization meter, gamma radiation, radiotherapy, fast neutron sensitivity, 1128
- ionization chamber, 598
- ionization chamber, tissue equivalent dosimeter, response, 2899
- neutron dosimetry, silicon diode, in vivo dosimetry, 743
- nuclear reaction, frequency of occurrence, 96
- fast particle radiation**, deuteron radiation, fast neutron radiation, fast proton radiation, lithium, neutron radiation, 3254
- fast proton radiation**, beryllium, dosimetry, fast neutron radiation, lithium, 2572
- beryllium, deuteron radiation, dosimetry, fast neutron radiation, neutron generator, characterization of neutron beam, 2662
- deuteron radiation, fast neutron radiation, fast particle radiation, lithium, neutron radiation, 3254
- dosimetry, ferrous sulfate dosimeter, linear energy transfer, radiotherapy, 1130
- electron probe microanalysis, trace element, 3564
- oxygen isotope, radiation beam, beam localization, 3251
- fat**, model, pacemaker nerve cell, potassium channel, semiconductor, tetrodotoxin, 926
- fatigue**, accident, human factors research, industry, safety, human error, pattern analysis, ortho oblique type binary data decomposition, 717
- bone, bone strength, model, stress, bone bending fatigue strength, human, 3139
- car driving, model, stress, real situation simulation, highway driving, 3370
- compact bone, stiffness, stress fracture, scanning electron microscopy, cattle, 1903
- drowsiness, electricity, excitability, headache, nausea, worker, high voltage field, environmental effects, 3106
- electromyography, muscle strength, back muscle strength, shoulder arm strength, determination, apparatus, 1116
- electromyography, muscle performance, triceps surae muscle, total torque, weighted emg sum, man, 2029
- fatty acid ester**, computer, gas chromatography, mass spectrometry, phospholipid, triglyceride, 3047
- fatty liver**, ammonium, aspartate aminotransferase blood level, brain edema, computer,

- electroencephalography, encephalopathy, exchange blood transfusion, furosemide, mannitol, reye syndrome, 7 children, 779
- feedback system**, anesthesia, blood pressure, halothane, 3 patients, 1134
 - cell growth, mathematic model, 1650
 - cybernetics, memory, philosophy, 2007
 - electroencephalography, epilepsy, excitatory postsynaptic potential, filter, inhibitory postsynaptic potential, model, nerve cell network, neuron population, 3548
 - electrostimulation, median nerve, perception, prosthesis, 2262
 - eye movement, head movement, mathematic model, vision, eye head coordination, 1669
 - man machine interaction, 3606
 - mathematic model, movement, muscle contraction, muscle tone, human arm model, 3523
 - mathematic model, nerve cell potential, model encoders, 1331
 - statistics, least square method, parameter estimation, 1259
- femoral angiography**, atherosclerosis, cholesterol, computer, densitometry, cadaver angiograms, 1599
- femoral artery**, aorta, artery flow, blood flow, blood vessel, carotid artery, doppler ultrasound flow meter, transcutaneous vs implanted cuff, 224
 - aortography, peripheral occlusive artery disease, transaxillary aortography, special catheter, 230 cases, 722
 - artery, artery flow, doppler ultrasound flow meter, information processing, model, transfer function model, 3543
- femoral neuropathy**, anticoagulant agent, computer assisted tomography, retroperitoneal hematoma, 2 case reports, 3060
- femoral vein**, elasticity, jugular vein, shear stress, dog, 2793
- femur**, acrylic acid, prosthesis, stress, total hip prosthesis, charnley prosthesis, 2261
 - articular cartilage, cartilage, shear stress, viscoelasticity, rabbit, 38
 - biomechanics, endoprosthesis, biomechanics of stress and strain, 3740
 - biomechanics, bone strength, stress, three dimensional analysis, human, 2028
 - bone, bone piezoelectric potential, collagen, collagen crosslink, binding sequence, rat, 2066
 - bone stress, centrifuge, gravitational stress, weightlessness, 3g mouse, 2647
 - femur neck pin, osteomyelitis, pseudarthrosis, 31 cases, interlocking nail, 3741
 - fracture, hip, implant, joint total replacement, mathematic model, prosthesis, 3131
 - joint, tibia, position control, schistocerca, 3149
 - leg lengthening, tibia, extension nail, 2643
- femur fracture**, fracture healing, osteosynthesis, finite element analysis, fixation device, 3132
- femur greater trochanter**, methacrylic acid methyl ester, osteotomy, total hip prosthesis, surgical technique: carbide drills, prosthesis extraction, 2383
- femur neck pin**, femur, osteomyelitis, pseudarthrosis, 31 cases, interlocking nail, 3741
- femur osteotomy**, biomechanics, knee, tibia osteotomy, stress correction, 2798
- femur shaft**, age, sex, structure strength, 37 human, 892
- fentanyl**, abdominal wall, muscle tone, rectus abdominis muscle, transducer, measurement, 143
- ferrous sulfate dosimeter**, dosimetry, gamma radiation, radiotherapy, calibration comparison, 730
 - dosimetry, fast proton radiation, linear energy transfer, radiotherapy, 1130
- alpha fetoprotein**, chorionic gonadotropin, computer assisted tomography, retroperitoneal cancer, testis cancer, 4 cases, 3822
- fet semiconductor**, amplifier, cryogenics, microwave radiation, signal noise ratio, 107
 - fire alarm, smoke detection, hydrogen detector, 148
 - mathematic model, signal noise ratio, 2485
 - model, nerve cell potential, 1743
- fetus**, amnion fluid, breathing mechanics, echography, lung, time distance recorder, 2163
 - amnion fluid, amnion sac, drug distribution, drug metabolism, placenta transfer, guinea pig, rabbit, gottinger miniature pig, intraamniotic application method, intraamniotic administration, 3717
 - carbon monoxide, carboxyhemoglobin, mathematic model, mother, uptake and elimination, sleep, 464
 - cardiotocography, pregnancy, multichannel monitor, 1549
 - cardiotocography, electrode, fetus monitoring, scalp, stainless steel, fine stainless steel wire, 100 cases, 339
 - computer, delivery, fetus heart rate, labor, pregnancy, 1571
 - doppler ultrasound flow meter, fetus heart rate, stethoscope, fetus viability, monkey, 1040
 - doppler ultrasound flow meter, echography, pulsed doppler system, 1428
 - electrocardiography, signal noise ratio, real time ecg, 480
 - fetus maturity, pregnancy, 20 women, recorder, 3212
 - hypoxia, mathematic model, oxygen consumption, placenta, uterus contraction, 205
- fetus electrocardiography**, electrocardiography, information processing, vectorcardiography, fetus, 2478
 - electrocardiography, noninvasive extraction, 749
- fetus electroencephalography**, 9 cases, electroencephalographic findings, 9 infants, neurologically abnormal at year age, computer program, 352
- fetus heart rate**, cardiography, echography, electrocardiography, heart rate, monitoring, siemens partecust, 32

- computer, delivery, fetus, labor, pregnancy, 1571
- congenital malformation, ultrasonics, mouse, 2573
- doppler ultrasound flow meter, fetus, stethoscope, fetus viability, monkey, 1040
- doppler ultrasound flow meter, monitoring, new technique, 1552
- fetus monitoring, pregnancy, telemetry, evaluation, hewlett packard 78100a, 521
- heart rate, information processing, labor, microprocessor, 1865
- fetus hypoxia**, computer, fetus monitoring, pregnancy, 106 cases, computer analysis, deceleration delay index, 2327
- fetus maturity**, fetus, pregnancy, 20 women, recorder, 3212
- fetus monitoring**, cardiocotography, electrode, fetus, scalp, stainless steel, fine stainless steel wire, 100 cases, 3395
 - computer, fetus hypoxia, pregnancy, 106 cases, computer analysis, deceleration delay index, 2327
 - fetus heart rate, pregnancy, telemetry, evaluation, hewlett packard 78100a, 521
- fiberglass**, capillary, microelectrode, micropipette, fiberglass filament introducing, 501
- fiberscope**, connector plug, optical waveguide, 1400
 - dilatometry, displacement indicator, interferometry, laser, 1405
 - ear densitometer, heart output, output measurement, children, 2940
 - endoscopy, esophagus foreign body, foreign body extraction, gastrointestinal tract, stomach, special snare, coins, children, adults, 1034
 - eye photography, ophthalmoscopy, transscleral illumination, 1093
 - eye surgery, lacrimal duct, lacrimal sac, device, 'pig tail' probe, 1094
 - head trauma, intracranial pressure, monitoring, pressure transducer, 46 cases, 2231
 - heart catheterization, oximetry, photometry, 3240
 - heart catheterization, oximetry, oxygen blood level, oxygen saturation, design, 1812
 - image intensifier, radiography, image contrast, 1916
 - laryngoscopy, small laboratory animals, hamster, rat, 2951
 - microphone, ultrasonics, 2574
 - ophthalmodynamometry, new device, 1096
 - optic nerve fiber, review, 567
- fibrinogen**, blood clotting, electricity, dog, 2921
- fibrinolysis**, blood clotting, electricity, dog, 1039
- fibroblast**, cell culture, cyclotron, fast neutron radiation, hemopoietic cell, leukemia cell, gamma radiation, relative biologic effectiveness, radiologic calibration program, hamster, human fibroblast, mouse, guinea pig, 2094
 - population analysis, 3115
- filament**, adenosine triphosphate, muscle contraction, myosin, sliding filament theory, molecular mechanism, 444
- film dosimeter**, computer assisted tomography, dosimetry, dosimetry system, 3082
- filter**, air sampling, atmospheric radioactivity, radon daughter, filter efficiency, 1337
 - air sampling, dust, dust loading characteristics, high inertial fibrous filters, 2863
 - breathing apparatus, gas mask, industrial hygiene, respirator absorbent filters, characterization, 649
 - electroencephalography, spike, detection, 2548
 - electroencephalography, epilepsy, excitatory postsynaptic potential, feedback system, inhibitory postsynaptic potential, model, nerve cell network, neuron population, 3548
 - hodgkin disease, radiotherapy, roentgen dose distribution, tissue compensating filter, moire topography, 307
- filtering**, image processing, information processing, charge coupled device, 3602
- finance**, administration, minicomputer, patient care, medium scale computer converting to mini, 2875
- finger**, blood pressure, cooling, raynaud phenomenon, skin temperature, pressure measurement, human, 2208
 - electrode, impedance, plethysmography, electrode configuration, 1911
- finger nail**, nail, physical measurement device, 2417
- fingerprint**, dactyloscopy, photography, mirror fingerprint, new method, 2861
 - analysis, 3599
 - detection, review, 3598
- finger tip**, limb prosthesis, powered prosthesis, design, grip, 1108
- fire alarm**, fet semiconductor, smoke detection, hydrogen detector, 148
- fire protection**, fluid, cost effectivity, 202
- fire risk**, accident, burn, catheter, nasogastric tube, oxygen breathing, case, 229
- first aid**, hyperbarism, resuscitator, 3 types, comparison, reliability, 320
- first heart sound**, computer, analysis, normal human, 3265
- fission neutron radiation**, dosimetry, fast neutron radiation, luminescence dosimeter, gamma radiation, 2159
- fixation**, bone stress, implant, joint total replacement, poly(methacrylic acid methyl ester), strength of bonding, cyclic tensile loading, 865
- flagella**, cilium, mathematic model, twisted filament, displacement, sliding, 37
- flash lamp**, chemical kinetics, photolysis, 2561

- floor covering**, conductivity, electric accident, gas discharge, medical instrumentation, safety, 2292
- flow**, airway, lung compliance, lung volume, tube, wave speed limitation, unifying concept, 1713
 - blood viscosity, mathematic model, viscosity, radial viscosity, 1306
 - elasticity, lecithin, mathematic model, shear rate, suspension, viscosity, 1710
 - elasticity, oscillation, tube, collapsible tube, 1705
 - heart valve, heart valve disease, heart valve prosthesis, model, flow resistance assessor, 1447
 - human serum albumin i 131, indicator dilution curve, iodine 125, tube, branching network, 1708
 - indicator dilution curve, mathematic model, fluid flow rate, 1707
 - laser, photography, speckle photography, 2496
 - mathematic model, thermodynamics, urinary tract, parallel flow tube, 2061
- flowmeter**, air flow, turbine, 3232
 - anesthetic equipment, gapmeter tap kit, 747
 - blood flow, catheter, velocity, cross section and flow, 2199
 - blood flowmetry, doppler ultrasound flow meter, 3708
 - doppler ultrasound flow meter, readout, 1380
 - hot water, 1802
- flow model**, fluid dynamics, tube, collapsible tube, oscillation, 3544
- flow probe**, aorta flow, blood flow, probe placement device, 3297
- fluid**, behavior, dispenser, multiple liquid dispenser, catfish, 2970
 - fire protection, cost effectivity, 202
- fluid dynamics**, flow model, tube, collapsible tube, oscillation, 3544
- fluidics**, cell membrane, cell membrane permeability, diffusion, mathematic model, 2431
- fluid intake**, circadian rhythm, computer model, ethanol, mouse, 400
- fluorescein derivative**, cell, cytometry, device, 1346
- fluorescein retina angiography**, eye fundus, eye photography, stereophotogrammetry, new device, 3587
- fluorescence**, air pollution, digital computer, multichannel analyzer, roentgen radiation, serum, 3277
 - apomyoglobin, fast decay measurement, 176
 - cell membrane potential, nerve cell membrane potential, thermodynamics, 2838
 - chemotracer, roentgen radiation, compton scattering, 586
 - colloid, deoxyribonucleic acid, electric field, macromolecule, induced fluorescence, 1831
 - cyclohexane, erythrosis, gamma counting, 1402
 - fluorometry, phase detection, 3642
 - gamma counting, 1403
 - imaging system, roentgen radiation, imaging system evaluation, 2661
 - light modulator, 4 ps. life time, 2501
 - mathematic model, pattern recognition, system identification, moments, 2895
- fluorescent scanning**, americium, iodine, gamma radiation, thyroid gland, concentric source detector design, 38
- fluoride**, carbon dioxide, carbon monoxide, gas diffusion, helium, lung diffusion, mathematic model, oxygen, binary diffusion coefficient, 2828
- fluorimeter**, computer, digital computer, gamma counting, spectrometry, 1404
- fluorometry**, fluorescence, phase detection, 3642
 - light modulator, phase fluorometer, 571
- fluoroscopy**, artificial heart pacemaker, electromagnetic field, heart arrhythmia, interference, external denia pacemaker, 1041
 - assisted circulation, coronary care unit, electrocardiography, hemodynamics, monitoring, 3353 patients, 38
 - bed coronary care unit, 217
 - computer assisted tomography, videorecording, 1963
 - fourier transform, image processing, modulation transfer function, mottle analysis, intensifying screen, power spectrum, 498
 - image intensifier, radiography, calibration, 1534
 - modulation transfer function, radiography, 1928
 - radiation protection, automatic controlled unit, survey, 719
 - soft tissue, trace element, sample mass determination, 2902
- focal illumination**, evoked visual response, ophthalmoscopy, retina, retina illumination, hand-held and two channel stimulator, new device, 2244
- focal point**, camera, radiography, focal spot camera, 3767
 - image processing, radiography, roentgen tube, 317
 - image quality, magnification radiography, modulation transfer function, 724
 - image quality, magnification radiography, model, modulation transfer function, 723
 - image quality, magnification radiography, model, modulation transfer function, 722
 - modulation transfer function, roentgen radiation, 93
- folinate calcium**, cancer, computer program, drug half life, kidney failure, mathematic model, methotrexate, pharmacokinetics, 5 patients, 3435
- follow up**, computer program, life table, population model, risk factor, survival rate, 1637

food chain, agriculture, chelating agent, penthanil, plant, plutonium 239, radioactive contamination, pu 239 uptake, usa, 95

foot, ankle, anterior tibial muscle, electromyography, gastrocnemius muscle, joint, rotation, soleus muscle, sinusoidal torque, human, 895

foot pressure, foot sole, measurement of pressure distribution, 3358

foot sole, foot pressure, measurement of pressure distribution, 3358

forced expiration, air flowmeter, airway obstruction, bronchial asthma, histamine, simple device, 3710

- forced expiratory volume, spirometry, 2 electronic devices comparison, 1870
- peak flow meter, schoolchildren, equipment bias, 1477

forced expiratory volume, air flowmeter, lung function test, device, 2607

- airway, elastic tube, lung compliance, tube flow, wave speed theory, 1714
- computer, dyspnea, medical record, pneumoconiosis, subjective appreciation, 3847
- forced expiration, spirometry, 2 electronic devices comparison, 1870

forceps, cheek, new instrument, bivalved cheek forceps, 2679

- laparoscopy, manipulator, sterilization, uterus, bipolar principle, 660

force transducer, biting pressure, piezoelectric transducer, volunteers, 507

- gastrointestinal tract, silicone, strain gauge transducer, contraction, implantation, water proof, 2918
- implant, muscle contraction, telemetry, uterine tube, monkey, 1770

forearm, electromyography, mathematic model, muscle, neuromuscular system, 2427

foreign body, endoscopy, storz hopkins system, child, infant, 3338

- esophagus, magnet, nasogastric tube, stomach, magnetic removal, 613

foreign body extraction, endoscopy, esophagus foreign body, fiberoscope, gastrointestinal tract, stomach, special snare, coins, children, adults, 1034

foreign body localization, computer assisted tomography, eye foreign body, orbit, perforating eye injury, 8 cases, 794

- electron probe, eye foreign body, eye injury, perforating eye injury, roentgen analysis, case report, technique, 2255

forelimb, biomechanics, intraarticular pressure, joint, ligament, tendon, race horse, 2805

forensic medicine, blood stain, clothing, isoenzyme, lactate dehydrogenase, soil, weapon, species origin, 3276

forensic odontology, cadaver identification, computer, record storage, identification method, 1556

forensic science, frequency analysis, larynx prosthesis, sex identification, speech spectrography, vocal system, 12 volunteers, experimental study, 3107

formant, speech, voice spectrography, vowel, 3216

forward heart failure, assisted circulation, heart output, oxygen, external counter pulsator, 636

fourier transform, action potential, heart rate, information processing, point process, 71

- air pollution, spectrometry, infrared radiation, 3654
- algorithm, image processing, 3514
- algorithm, digital filtering, fast fourier transform, 2529
- algorithm, computer assisted tomography, image processing, 2342
- averaging, electrocardiography, electroencephalography, phase locking, 1945
- biomechanics, heart ventricle, functional model, 1664
- blood, bone, compartment model, tissue, markov model, 2778
- cell, cytology, image processing, uterine cervix cytology, 2511
- circadian rhythm, digital computer, information processing, progressive analysis, 2391
- communication, spectrum structure, dolphin, 3531
- computer assisted tomography, modulation transfer function, 3 d image, 1978
- computer assisted tomography, image processing, gamma radiation, scintigraphy, 1218
- computer assisted tomography, image processing, 368
- computer program, fortran, 2405
- cytology, image processing, pattern recognition, microscopy, 3596
- data transmission, image processing, projection, 979
- digital computer, electroencephalography, spectrometry, 3806
- digital computer, hardware, 1261
- digital filtering, evoked response, mathematic model, 1750
- doppler ultrasound flow meter, image processing, signal processing, convolution method, 3028
- electrocardiography, deconvolution method, 2479
- fluoroscopy, image processing, modulation transfer function, mottle analysis, intensifying screen, power spectrum, 498
- heart rate, information processing, 1716
- holography, image processing, deconvolution method, 1367
- holography, roentgen radiation, 4.48 nm xrays, 1125
- image processing, microscopy, pattern recognition, mellin transfer, 1008
- image processing, discrete transformation, 1541
- image processing, spectrometry, phase spectrum, walsh transform, 1530

- image processing, nuclear magnetic resonance, element analysis, 2873
- image processing, positron camera, radioisotope, positron annihilation, 728
- image processing, pattern recognition, shape discrimination, 1777
- information processing, lung, pneumography, 2053
- infrared radiation, spectrometry, chemistry, 3656
- infrared radiation, spectrometry, polymer analysis, 3655
- laplace law, lateral eye, lateral inhibition, neural set, limulus, 2248
- laplace law, 1653
- liquid crystal, spectrometry, temperature dependence, 1816
- microwave radiation, spectrometry, 3663
- model, modulation transfer function, tomography, linearding mechanism, 3756
- nuclear magnetic resonance, phase detection, quadrature phase, 185
- sampling, procedure, 880
- sampling, evaluation, 879
- spectrometry, hadamard transform, comparison, 1399
- reciprocal transform, 3513
- high speed convolution, 1655
- window function, 2410
- markov statistics, 877
- array processor, 33
- bivariate function, 1648
- fourth brain ventricle**, brain aqueduct, brain stem, brain tomography, computer assisted tomography, dorsum sellae, transverse cut, frontal cut, clivo parallel cut, method, human brain model, 2716
- fracture**, acrylic acid, bone cement, stress fracture, fracture characteristics, 1624
 - biomechanics, bone infection, fracture external fixation, osteosynthesis, survey, 1109
 - callus, electret, electrodynamic callus, electrostatic callus, rat, 1528
 - femur, hip, implant, joint total replacement, mathematic model, prosthesis, 3131
 - fracture external fixation, model, mechanics of oblique fracture fixation, 887
 - fracture healing, tibia fracture, cyclic loading, rabbit, 1273
- fracture external fixation**, ankle, joint mobility, osteosynthesis, physiotherapy, rehabilitation, talipes equinus, tibia fracture, foot movement plate, 3742
 - arthrodesis, congenital hip dislocation, limb lengthening, pseudarthrosis, 48 patients, ilizarov apparatus, 3743
 - biomechanics, bone infection, fracture, osteosynthesis, survey, 1109
 - bone cement, methacrylic acid methyl ester, 3359
 - fracture, model, mechanics of oblique fracture fixation, 887
- fracture healing**, biomechanics, tibia fracture, internal junction, 2030
 - femur fracture, osteosynthesis, finite element analysis, fixation device, 3132
 - fracture, tibia fracture, cyclic loading, rabbit, 1273
- free radical**, computer, deoxyguanosine phosphate, erythrocyte sedimentation rate, gamma radiation, computer analysis of esr spectrum, 2343
- freeze drying**, bladder, chloride, potassium, roentgen analysis, skin, sodium, soft tissue, frog, toad, 2860
 - electron microscopy, microscope slide, critical point drying, 3224
- freeze etching**, electron microscopy, microphotometry, microscope slide, 3223
- freezing**, frozen section, tissue fixation, fast freezing device, freeze etch replication, 3206
- freon**, krypton, xenon, freon 13 b1, gas mixture, 68
- frequency analysis**, automation, computer, electroencephalography, information processing, 776
 - computer, electrocardiography, dominant component evaluation, 2760
 - computer, electroencephalography, psychologic test, wechsler scale, intellectual factor, 56 children, 2704
 - computer assisted tomography, electroencephalography, scalp, 350 intracerebral organic lesions, 3425
 - echocardiography, 2911
 - electric field, mathematic model, nerve fiber membrane potential, volume conductor, 932
 - electrocardiography, recording, st segment, high side frequency filtration, 639
 - electroencephalography, temporal analysis, quantification, 1388
 - electroencephalography, statistical analysis, 1084
 - electroencephalography, transient events, 775
 - electroencephalography, quantification, 774
 - electroencephalography, hemisphere, cat, 1878
 - electromyography, motor unit potential, spike, firing time statistics, spectral analysis, 2077
 - electromyography, shape recognition, 3238
 - forensic science, larynx prosthesis, sex identification, speech spectrography, vocal system, 12 volunteers, experimental study, 3107
 - image intensifier, quantum mottle, 3759
 - mechanoreceptor, sensory system, nonlinear analysis, insect, 1329

- spectrometry, 1647
- frequency analyzer**, anesthesia, computer, electroencephalography, hypoxia, microprocessor, minicomputer, monitoring, display system, cerebral function analyzer monitor, 3805
- frequency discrimination**, cochlea microphonic potential, mathematic model, neural tuning curve, 2439
 - hearing, resolving power, 2982
- frequency following response**, hearing aid, hearing impairment, in situ test, acoustic pressure, 1897
- frequency meter**, spectrometry, speech, voice, fundamental frequency, 612
 - digital system, 3619
- frequency modulation**, amplitude modulator, generator, telemetry, 3585
 - artificial heart pacemaker, electrocardiography, monitoring, telemetry, telephone telemetry, 2678
 - generator, telemetry, voltage controlled oscillator, 519
 - generator, telemetry, voltage frequency converter, voltage controlled oscillator, 549
 - laser, molecular structure, spectrometry, derivative spectroscopy, 2146
 - light modulator, phase modulator, 3646
 - mathematic model, nerve cell network, 2084
 - microelectrode, nerve cell potential, telemetry, compact miniature system, rat, rabbit, 2619
 - phase lock amplifier, telemetry, 1772
 - telemetry, phase locked discriminator, fm detector, 123
- frequency multiplier**, square wave generator, 520
- frontal lobe**, brain blood flow, brain cortex, consciousness, schizophrenia, xenon 133, review, 49 references, 1074
- frozen blood**, blood bank, decision, utilization, 1838
- frozen section**, freezing, tissue fixation, fast freezing device, freeze etch replication, 3206
- functional residual capacity**, carbon dioxide, diving, dyspnea, exercise, helium, hyperbarism, lung volume, 49.5 ata, 6 divers, 1298
 - computer, end tidal carbon dioxide tension, intensive care, lung function test, mass spectrometry, monitoring, 2675
 - diaphragm, lung function, pneumography, 2952
 - lung compliance, pressure volume curve, vital capacity, model, human, 3164
 - lung function test, positive end expiratory pressure, measurement instrumentation, 2215
 - lung ventilation, respiration, occlusion pressure, volunteer, 2052
- function generator**, dosimetry, heater, thermoluminescence, heating rate, 592
- fungus**, aerosol, asepsis, bacterial pollution, bronchial asthma, infection, risk, 27 apparatuses, 18 subjects, mobile use, 1478
- furosemide**, ammonium, aspartate aminotransferase blood level, brain edema, computer, electroencephalography, encephalopathy, exchange blood transfusion, fatty liver, mannitol, reye syndrome, 7 children, 779
- fusimotor muscle**, extrafusal muscle fiber, mathematic model, muscle spindle, beta nerve fiber, chelonian spindle, 496
- gadolinium 153**, bone, photon absorption, proportional counter, xenon filled multiwire counter, 2095
- gait**, cerebral palsy, electromyography, hemiparesis, muscular dystrophy, telemetry, temporal information, 100 cases, 1904
 - cinematography, electromyography, telemetry, analysis method, daily orthopedic practice, 843
 - computer, locomotion, computer analysis, 3473
 - computer, automatic analysis, 1996
 - diagnosis, electromyography, locomotion, pattern recognition, 19 patients, 1906
 - electromyography, movement, telemetry, volunteer, 1769
 - information processing, locomotion, 2088
 - leg brace, oxygen consumption, rehabilitation, spinal cord injury, spinal cord transverse lesion, walking, 3 cases, pneumatic orthosis, 289
 - locomotion, movement, derivative determining technique, 1997
 - sex, walking aid, sex recognition, dynamic point light display, human, 1901
 - walking, speed measurement, 1115
- gallbladder disease**, abdomen, computer assisted tomography, liver disease, varian six second body scanner, 34 cases, 1185
- gallium 67**, abdomen scintiscanning, abdominal abscess, abscess scanning, computer assisted tomography, echography, 22 cases, 1175
- gallium 68**, brain blood flow, brain scintigraphy, computer assisted tomography, edetic acid, krypton, positron emission tomography, positron scintiscanning, 120 cases, 799
- gallstone**, cholelithiasis, common bile duct, endoscopy, lithotripsy, 1036
- galvanic current**, bioenergy, power supply, voltage frequency converter, rat, dog, rabbit, 928
- galvanic skin response**, SEE skin conductance

- gamma counting**, computer, digital computer, fluorimeter, spectrometry, 1404
 - computer assisted tomography, noise, statistics, general expression, 1176
 - cyclohexane, erythrosis, fluorescence, 1402
 - fluorescence, 1403
 - hospital laboratory, iodine 125, radioimmunoassay, 3250
 - luminescence, reference source, 1401
- gamma emitter**, radioisotope, calibration, 97
- gamma spectrometry**, iodine 125, iodine 131, method, 3667
- gas**, blood oxygen tension, countercurrent multiplier system, mathematic model, oxygen electrode, swimming device, experimental model verification, eel, 914
 - carbon dioxide, gas chromatography, nitrogen, oxygen, scholander method, 1394
 - gas diffusion, gas mixing, laminar air flow, flowing gas, 1296
 - gas flow, mass spectrometry, respiration, gas inlet, control, 1347
- gas analysis**, arterial carbon dioxide tension, arterial oxygen tension, gas chromatography, continuous measurement, gas chromatographic catheter, 563
 - carbon dioxide, lung closing volume, lung function test, water, acoustic analyzer, 2218
- gas bubble**, blood pressure, echography, heart ventricle pressure, ultrasonics, noninvasive measurement, 1471
 - decompression sickness, mathematic model, gas cavitation nuclei, 463
 - equation, lung diffusion, neon, nitrogen, oxygen, respiration, counter diffusion, 2051
- gas chromatography**, arterial carbon dioxide tension, arterial oxygen tension, gas analysis, continuous measurement, gas chromatographic catheter, 563
 - bone cement, methacrylic acid, spectrophotometry, residue determination, 1623
 - carbon dioxide, gas, nitrogen, oxygen, scholander method, 1394
 - computer, fatty acid ester, mass spectrometry, phospholipid, triglyceride, 3047
 - helium, inert gas, gas measurement, 3636
 - on-stream chromatograph, 3211
- gas detection**, hot climate, tube, extreme conditions, 2552
- gas diffusion**, blood rheology, carbon dioxide, hemoglobin, mathematic model, oxygen, ph, 1307
 - carbon dioxide, carbon monoxide, fluoride, helium, lung diffusion, mathematic model, oxygen, binary diffusion coefficient, 2828
 - gas, gas mixing, laminar air flow, flowing gas, 1296
 - gas exchange, hypoxia, myoglobin, tissue cylinder, 2450
 - gas mixing, helium, nitrogen, oxygen, water vapor, binary and ternary diffusion, 1295
- gas discharge**, conductivity, electric accident, floor covering, medical instrumentation, safety, 2292
- gas embolism**, extracorporeal circulation, nitrogen, oxygenator, possible contra indication, 1481
- gas exchange**, air, argon, bubble, nitrogen, bubble formation measurement, 1348
 - compartment model, lung blood flow, lung diffusion, lung model, lung ventilation, lung ventilation perfusion ratio, inequalities, theoretical analysis, 462
 - computer, lung function test, lung ventilation, 1992
 - computer model, countercurrent multiplier system, mathematic model, swimming device, 913
 - digital computer, information processing, spirometry, 2756
 - exercise, heart output, oxygen consumption, output determination, 2201
 - gas diffusion, hypoxia, myoglobin, tissue cylinder, 2450
 - lung diffusion, on line digital integration, 2376
- gas flow**, gas, mass spectrometry, respiration, gas inlet, control, 1347
 - pump, closed system, 1374
- gas mask**, breathing apparatus, filter, industrial hygiene, respirator absorbent filters, characterization, 649
 - refraction, spectacle glasses, vision, spectacle inserts, 2630
- gas mixing**, gas, gas diffusion, laminar air flow, flowing gas, 1296
 - gas diffusion, helium, nitrogen, oxygen, water vapor, binary and ternary diffusion, 1295
- gas pump**, closed system, 1803
- gas transport**, convection, lung diffusion, mathematic model, respiration, green function, 2050
- gastrocnemius muscle**, ankle, anterior tibial muscle, electromyography, foot, joint, rotation, soleus muscle, sinusoidal torque, human, 895
 - mathematic model, muscle isometric contraction, linear equation, rat, 1660
- gastroenterology**, data base, information processing, medical record, 1611
- gastroesophageal reflux**, esophagus ph, ph electrode, stomach acid, automatic analysis, 1836
- gastrointestinal hemorrhage**, argon laser, gastroscopy, laser, stomach ulcer, dogs, device, treatment, 3274
 - computer, electrocoagulation, electrode, gastroscopy, stomach ulcer, dogs, computer controlled electrocoagulation, 3058
- gastrointestinal motility**, esophagus achalasia, esophagus peristalsis, esophagus pressure, gastrointestinal tract, pressure transducer, scleroderma, 1351
 - gastrointestinal tract, mathematic model, 2089
- gastrointestinal tract**, biopharmaceutics, drug release, mathematic model, pharmacokinetics, 1627

- endoscopy, esophagus foreign body, fiberoscope, foreign body extraction, stomach, special snare, coins, children, adults, 1034
- esophagus achalasia, esophagus peristalsis, esophagus pressure, gastrointestinal motility, pressure transducer, scleroderma, 1351
- force transducer, silicone, strain gauge transducer, contraction, implantation, water proof, 2918
- gastrointestinal motility, mathematic model, 2089
- gastrochisis**, omphalocele, pneumatic reduction device, description of technique, 3684
- gastroscopy**, argon laser, gastrointestinal hemorrhage, laser, stomach ulcer, dogs, device, treatment, 3274
 - computer, electrocoagulation, electrode, gastrointestinal hemorrhage, stomach ulcer, dogs, computer controlled electro coagulation, 3058
- gastrulation**, anatomy, cell structure, embryogenesis, mathematic model, tissue, 3510
- gating**, SEE gating circuit
- gating circuit**, cell membrane conductance, nerve fiber membrane, potassium channel, sodium channel, transient polarization current, squid, 2070
 - dipole theory, excitable membrane, ion channel, 3178
 - beta endorphin, iontophoresis, naloxone, accurate current monitoring system, 3209
 - lipid membrane, membrane potential, bilayer membrane, 869
 - membrane capacitance, gating current, 494
 - nerve fiber membrane, electrostatic interaction, 2836
 - nerve fiber membrane potential, sodium channel, gating current blocking, squid, 3550
- gaze paralysis**, computer assisted tomography, hemiplegia, miosis, thalamus hemorrhage, 18 cases, 814
- geiger mueller counter**, dosimetry, fast neutron radiation, ionization meter, gamma radiation, radiotherapy, fast neutron sensitivity, 1128
- gene**, mathematic model, stability, 6
- gene frequency**, inheritance, migration, mutation, population model, statistics, stochastic model, island model, 2788
- general practice**, computer, health center, health visitor, information processing, medical record, nursing, public health service, social worker, real time management, great britain, 840
- generator**, amplitude modulator, frequency modulation, telemetry, 3585
 - aversion therapy, behavior disorder, odor, smelling, olfactory procedure, new apparatus, 244
 - circadian rhythm, zeitgeber, 2 coupled oscillator, 2967
 - cryogenics, nuclear magnetic resonance, stability, 182
 - electromagnetic radiation, electron spin resonance, nuclear magnetic resonance, marginal oscillator, 1415
 - frequency modulation, telemetry, voltage controlled oscillator, 519
 - frequency modulation, telemetry, voltage frequency converter, voltage controlled oscillator, 549
 - iridium 191, iridium 191m, osmium 191, scintiangiocardiology, improved generator, ir 191m application in monkey, 1333
 - molybdenum 99, technetium 99m, multifold generator, testing, 98
 - semiconductor, vo2 transition metal oxide, 1357
 - telemetry, voltage controlled oscillator, 3215
 - frequency divider, 958
- genetic code**, mathematic model, prewobble hypothesis, 2386
- genetic polymorphism**, computer assisted diagnosis, computer program, diagnosis, parenthood, paternity, 3419
- genetics**, ecology, population model, 34
 - ecology, polymorphism, population model, stability, 2769
- germination**, corn, environment, microwave radiation, 2152
- gingiva**, computer, data base, education, oral biopsy, tooth care, oral biopsy data, 8 dental schools, usa, 3471
- glanzmann disease**, cell aggregation, staphylococcus aureus, thrombocyte aggregation, willebrand disease, measurement device, 3283
- glass capillary**, blood viscosity, shear rate, different shear rates, 3170
- glass electrode**, cell membrane potential, kidney slice, microelectrode, sweat gland, self filling, semifloating, rat, 1805
 - electrode, microelectrode, stereotaxic surgery, filling procedure, 1888
 - etching agent, hydrofluoric acid, micropipette, tip etching, 2539
 - microelectrode, multibarrelled electrode, blank preparation, 3237
- glaucoma**, age, closed angle glaucoma, computer, open angle glaucoma, prevalence, 1231
 - applanation tonometry, intraocular pressure, tonometry, 2 new types, patients, normal subjects, 2247
 - aqueous humor outflow, iridectomy, laser, required energy, 2249
 - comparator, optic disk, stereophotography, new device, 3733
 - computer, perimetry, visual field, 2379
 - eye, optic disk cup, stereophotography, fundus, 126
- glioblastoma**, brain abscess, computer assisted tomography, density, encephalopathy, measurement of mean density, 798
 - brain contusion, cerebrovascular disease, computer assisted tomography, hydrocephalus, meningioma,

- glioma**, brain angiography, brain cancer, brain scintigraphy, computer assisted tomography, case report, 3439
 - brain scintigraphy, brain tumor, computer assisted tomography, multifocal glioma, case, 2338
 - brain tumor, computer assisted tomography, diatrizoate, hypophysis adenoma, meningioma, non contrast scanning, 299 cases, 3457
- glomerulopathy**, histopathology, information processing, statistics, cluster analysis, 2959
- glucagon**, blood glucose, glucose tolerance test, insulin release, mathematic model, model studies, 3113
- glucocorticosteroid**, brain depth stimulation, brain edema, electrode, electrode impedance, mannitol, seizure, somatomotor epilepsy, visual cortex, cat, 1489
- glucose**, computer model, energy transfer, glycolysis, heart muscle, heart perfusion, nicotinamide adenine dinucleotide, reduced nicotinamide adenine dinucleotide, rat, 1631
- glucose regulation**, computer, monitoring, in dogs, 1230
- glucose tolerance test**, blood glucose, glucagon, insulin release, mathematic model, model studies, 3113
 - computer model, digital computer, insulin, plasma, proinsulin, 18 patients, 2767
- glycerol**, calcium, muscle fiber, troponin, psoas muscle, filament overlap, rabbit, 3146
- glyceryl trinitrate**, echocardiography, heart left ventricle volume, continuous assessment, 28 patients, analog conversion system, 644
- glycogenolysis**, adenosine triphosphatase, computer model, glycolysis, heart perfusion, hypoxia, lactate permease, rat, 2170
- glycolysis**, adenosine triphosphatase, computer model, glycogenolysis, heart perfusion, hypoxia, lactate permease, rat, 2170
 - adenosine triphosphate, erythrocyte, mathematic model, human erythrocyte, 3116
 - cell growth, cell population, circadian rhythm, metabolism, 2792
 - computer model, energy transfer, glucose, heart muscle, heart perfusion, nicotinamide adenine dinucleotide, reduced nicotinamide adenine dinucleotide, rat, 1631
- gold**, electrode paste, oxygen tension electrode, thin film electrode, 2891
- gold 198**, computer, dosimetry, iridium 192, radioisotope therapy, 2723
- golgi cell**, cerebellum cortex, mathematic model, nerve cell network, golgi cell function, 3558
- gonadotropin**, brain ventricle, cannulation, consciousness, growth hormone blood level, prolactin blood level, method, dual cannulation, awake rat, 671
- gonad radiation**, computer assisted tomography, radiation exposure, thermoluminescence dosimeter, 121 cases, emi scan, 2727
- goniometry**, knee, total motion goniometry, 888
- granular cell**, excitatory postsynaptic potential, hippocampus, information science, prediction of information theory, 2082
 - hippocampus, information science, mathematic model, nerve cell, synapse, information theory, 2081
- graphology**, aviation, image processing, pattern recognition, photography, 1695
 - curve tracer, pattern recognition, 2023
- gravitation**, arteriole, blood pressure, capillary flow, centrifuge, noradrenalin, 2 g centrifugation, second generation rats, carotid artery, mesentery arteriole, 716
- gravitational stress**, acceleration, hand, mathematic model, neck, human head neck system, dynamic response, predictive model, 3008
 - acceleration, head, neck, head neck dynamic response, 3007
 - bone stress, centrifuge, femur, weightlessness, 3g mouse, 2647
- gravity**, behavior, centrifuge, sitting, non linear properties, upright sitting human body, driving point impedance, 2652
- gray scale echography**, a scan, echooculography, new device, 2910
 - computer assisted tomography, prostate, prostate carcinoma, prostatitis, 8 cases, 2739
- great vessels transposition**, blood volume, indicator dilution curve, lung blood flow, model, new technique, 3703
- grip strength**, mouse, muscle strength, rat, recording device, 3361
- growth**, cancer growth, mathematic model, stability analysis, 2003
 - cell division, mathematic model, mitochondria, 1635
 - information processing, longitudinal data, public health, quality control, mixed longitudinal study, multidisciplinary study, netherlands, 2780
 - mathematic model, plant, leaf distribution, 2408
 - population model, distributed delay, 1643
- growth hormone blood level**, brain ventricle, cannulation, consciousness, gonadotropin, prolactin blood level, method, dual cannulation, awake rat, 671
- guinea pig**, ear surgery, operating table, 3399
- gynecologic cancer**, computer, dosimetry, radioisotope therapy, radiotherapy, 1200 cases, 1220
 - pelvis cancer, radiotherapy, radiation portal, verification film, 28 cases, 3377
- gynecology**, echocardiography, echoencephalography, echography, history, university of lund, 2193

- habituation**, orienting reflex, skin conductance, 2618
- hair**, araldite, embedding, cross sectioning, 294
- hair cell**, basilar membrane, cochlea, model, tuning model comparison, 2822
- hair grafting**, disposable punch, 291
- haloperidol**, acetylcholine, cholinergic system, computer model, dopamine, dopamine system, extrapyramidal system, theoretical aspects, 3328
- halothane**, anesthesia, blood pressure, feedback system, 3 patients, 1134
- hand**, acceleration, gravitational stress, mathematic model, neck, human head neck system, dynamic response, predictive model, 3008
 - airplane pilot, body posture, head, instrument panel, vibration, fighter bomber, lumped parameter biomechanical model, 3366
 - biomechanics, hand function, thumb, static forces, 42
 - biomechanics, metacarpophalangeal joint, 2027
 - computer, differential diagnosis, display system, information processing, parkinsonism, tremor, 1240
- hand dorsal interosseus muscle**, mathematic model, motor unit, muscle isometric contraction, human, 929
- hand function**, biomechanics, hand, thumb, static forces, 42
 - kinesiotherapy, pneumatic cushion foil, 706
- handicapped child**, electric wheelchair, supine position, 1525
 - meningomyelocele, mobility, orthotics, standing, 3002
- hand prosthesis**, artificial skin, back, disabled, skin, touch, 1908
- head**, acceleration, gravitational stress, neck, head neck dynamic response, 3007
 - acceleration, computer model, impact, mathematic model, neck, motor vehicle crash victim, calspan 3 d computer simulator, 2426
 - acceleration, computer program, impact, intervertebral disk, neck, comprehensive, three dimensional head neck model, 2650
 - acceleration, computer program, impact, mathematic model, muscle, neck, math modelling, volunteers, 1266
 - airplane pilot, body posture, hand, instrument panel, vibration, fighter bomber, lumped parameter biomechanical model, 3366
 - anesthesia, anesthetic equipment, inhalation anesthesia, head enclosure, monkey, 1545
 - brain, microwave radiation, radiation hazard, cross polarized wave, mammal, 583
 - cervical spine, computer assisted tomography, skull base, coronal head scan, 1214
 - microwave radiation, radiation absorption, thermography, man, monkey, 1819
 - model, parametric study, finite element, 1248
- headache**, acceleration, cardiovascular system, heart rate, mathematic model, stress, 2812
 - blindness, computer assisted tomography, epiphora, exophthalmos, mucocele, ophthalmoplegia, paranasal sinus, ptosis, 4 cases, 2737
 - brain hematoma, brain tumor, computer assisted tomography, head trauma, hydrocephalus, mental deficiency, seizure, 795
 - computer assisted tomography, cost benefit analysis, diagnosis, epilepsy, temporal lobe epilepsy, 107 cases, u.s.a., 1209
 - drowsiness, electricity, excitability, fatigue, nausea, worker, high voltage field, environmental effects, 3106
- head holder**, brain, stereotaxic device, stereotaxic implantation, mouse, 2622
 - computer assisted tomography, no water bath, 1969
- head movement**, acceleration, intracranial pressure, vibration, model, monkey, 3009
 - behavior, electromyography, neck muscle, photography, vision, 2638
 - cornea reflex, eye movement, tilting, eye rotation, torsional movement, human, 446
 - eye movement, feedback system, mathematic model, vision, eye head coordination, 1669
- head phone**, audiometry, 261
 - audiometry, telephone, calibration, frequency response, 1431
 - sound pressure, equivalent levels, 3 types of japanese earphones, 600
- head rest**, eye surgery, microsurgery, new device, 3354
- head trauma**, accident, helmet, crash impact response, nonlinear numerical prediction, 2809
 - brain, brain lesion, computer assisted tomography, 100 pediatric cases, 3757
 - brain atrophy, computer assisted tomography, electroencephalography, epilepsy, traumatic epilepsy, 78.070.297.P cases, 2330
 - brain atrophy, brain hemorrhage, computer assisted tomography, hydrocephalus, skull fracture, subdural hematoma, trauma, diagnosis, 1581
 - brain edema, cerebrospinal fluid, electroencephalography, hematoma, intracranial hypertension, tumor, cat, epidural pressure measurement, 1076
 - brain hematoma, brain tumor, computer assisted tomography, headache, hydrocephalus, mental deficiency, seizure, 795
 - brain hematoma, brain stem contusion, coma, computer assisted tomography, hygroma, 1000 consecutive patients, 1582
 - brain hemorrhage, computer assisted tomography, meningorrhagia, 1173

- brain ischemia, computer assisted tomography, hydrocephalus, 457 cases, 833
- computer assisted tomography, subarachnoid hemorrhage, 109 children, 3758
- fiberoscope, intracranial pressure, monitoring, pressure transducer, 46 cases, 2231
- injury, mathematic model, model, skull fracture, response probability density function technique, 3365
- model, primate, 2810
- health care delivery**, behavior, computer, information processing, ambulatory patients, 3406
 - computer, library, medical documentation, patient care, public health service, patient care, literature coordination, 2695
 - malpractice, medical engineering, medicolegal aspect, registration, district of columbia, 1242
- health care planning**, radiology department, resource allocation, canada, model, 3388
- health center**, computer, general practice, health visitor, information processing, medical record, nursing, public health service, social worker, real time management, great britain, 840
- health science**, education, 3403
- health service**, medical engineering, technological impact, 2576
- health visitor**, computer, general practice, health center, information processing, medical record, nursing, public health service, social worker, real time management, great britain, 840
- hearing**, acoustic nerve, mathematic model, vision, photo counter, 3157
 - acoustic nerve, information processing, nerve potential, goldfish, 3346
 - acoustic nerve, nerve potential, two tone stimulus, 2441
 - acoustic reflex, loudness discrimination, tympanic membrane impedance, 899
 - age, auditory threshold, hearing impairment, noise pollution, population research, 684
 - age, deafness, age dependence, 53
 - amplitude modulator, noise, pure tone audiometry, tone roughness, 56
 - amplitude modulator, pitch perception, nonspectral pitch, noise stimulus, 1087
 - audiometry, auditory threshold, external ear, free field audiometry, lateral vertical plane, 683
 - audiometry, bekesy audiometry, bekesy audiometer, 2259
 - audiometry, coyote, 1518
 - auditory discrimination, loudness, loudness discrimination, speech, vowel consonant, 703
 - auditory fatigue, auditory masking, auditory threshold, pure tone, 1088
 - auditory masking, binaural hearing, masking level, 702
 - auditory masking, echo, masking level differences, 701
 - auditory masking, pattern recognition, sound burst, 264
 - auditory masking, information science, 258
 - auditory masking, pattern recognition, signal noise ratio, pure tone, 2820
 - auditory masking, signal noise ratio, tone, 454
 - auditory masking, auditory threshold, 1681
 - auditory masking, critical band width, rippled noise masker, 1680
 - auditory masking, basilar membrane, model, 457
 - auditory masking, backward masking, forward masking, 60
 - auditory masking, intelligibility, noise, pure tone stimulus, 1505
 - auditory masking, temporal masking, 2257
 - auditory stress, ear trauma, environment, microphone, sound level measurement, conga microphone, 1019
 - auditory system, psychophysics, vision, 250
 - auditory threshold, reaction time, cat, titration procedure, 1092
 - basilar membrane, model, frequency discrimination, 1287
 - behavior, reaction time, restraining device, tone, cat, 2245
 - binaural hearing, rotating tone, beats, 699
 - binaural hearing, loudness perception, interaural intensity difference, 452
 - binaural hearing, sound lateralization, dichotic stimulus, 3348
 - binaural hearing, directional hearing, minimum auditory movement angle, 3345
 - binaural hearing, noise, pitch perception, review, 900
 - binaural hearing, tone burst, onset, ongoing, offset, temporal difference, 61
 - binaural hearing, intelligibility, speech, interfering speech, human, 55
 - binaural hearing, directional hearing, auditory time discrimination, 52
 - binaural hearing, directional hearing, auditory lateralization, complex waveform, 1089
 - binaural hearing, directional hearing, moving source, dichotic stimulation, 4 volunteers, 1284
 - binaural hearing, correlation function, 2984
 - cochlea, mathematic model, 2823
 - cochlea, coding, correlation function, mathematic model, signal processing, reverse correlation technique, 3154
 - cochlea microphonic potential, mathematic model, 2442
 - computer, sound, modulation analysis, bird, 3850
 - computer program, speech intelligibility, vowel, speech synthesis, 1030
 - consonant, speech, speech intelligibility, stop consonant, 453

- consonant, information science, intelligibility, speech synthesizer, vowel, phoneme boundary effect, voice onset time, 57
- deafness, speech, dichotomic hearing, speech compression, 2817
- deafness, speech, touch, 3352
- deafness, intelligibility, masking, signal noise ratio, 657
- deafness, hearing aid, speech, speech coding, 1513
- directional hearing, industrial medicine, sound detection, 265
- directional hearing, median sagittal plane, 1510
- display system, hearing impairment, shorthand display, 2488
- ear trauma, industrial noise, noise, noise pollution, chinchilla, threshold shift, 1283
- echo, intelligibility, signal processing, spectrometry, speech, 2819
- echo, hearing impairment, speech intelligibility, delayed speech, 2996
- frequency discrimination, resolving power, 2982
- industrial medicine, 262
- intelligibility, speech, child, 455
- intelligibility, signal noise ratio, speech, amplitude compression, 65
- intelligibility, speech, acoustic cues, 1512
- loudness, mathematic model, pitch, 2824
- loudness discrimination, noise stimulus, auditory critical bandwidth, 898
- loudness discrimination, parameter extraction, spectrometry, model, 910
- loudness discrimination, loudness perception, 2445
- loudness perception, 29 cases, 700
- loudness perception, variability, 2633
- microwave radiation, 2043
- model, nonlinear system, signal processing, residuum, 2818
- modulation, intermodulation, 2444
- music, timbre evaluation, 1511
- pitch, speech, speech synthesizer, speech evaluation, 2042
- pitch perception, pitch shift, 3349
- sound level measurement, speech, running speech, 611
- spectrometry, speech intelligibility, vocal cord, vowel, voice onset, fundamental frequency, vowel consonant, 259
- speech, speech intelligibility, onset discrimination, 456
- speech, nonsense syllable mimicry, 3351
- speech, speech intelligibility, vowel, l,r context, 54
- vision, visual feedback, time pattern, grasshopper, 2399
- pure tone, noise stimulus, loudness perception, 1000 and 3000 hz, 1086
- hearing aid**, audiology, earmold venting, filter effect, 3335
 - audiometry, bone conduction, bone conductor, frequency response, 1099
 - auditory recruitment, occupational deafness, speech intelligibility, protective hearing aid, 1102
 - auditory rehabilitation, speech, processing of signals, 2977
 - auditory rehabilitation, speech, australia, 1520
 - auditory training, deafness, 2980
 - battery, development, 685
 - cochlea, deafness, electrode, implantation, prosthesis, multiple electrode system, 3341
 - deafness, no mold fitting, 1098
 - deafness, perception deafness, gain, frequency response, 1090
 - deafness, hearing, speech, speech coding, 1513
 - deafness, intelligibility, noise, signal noise ratio, speech discrimination, 34 patients, peak clipping, automatic pain control, 2628
 - digital computer, hearing aid test, 3411
 - earmould, sound level, real ear canal, 2 cm3 coupler, zwislocki coupler, 3355
 - earmould, model, resonance, sound filtering, side branch, parallel vent, acoustical model, electrical model, 3729
 - frequency following response, hearing impairment, in situ test, acoustic pressure, 1897
 - hearing impairment, speech intelligibility, binaural, test procedure, 2978
 - hearing impairment, perception deafness, frequency converter, 1523
 - perception deafness, presbycusis, 261 patients, follow up, 1103
 - perception deafness, speech discrimination, radio frequency clipping, taped speech, 2239
 - satisfaction, questionnaire, analysis, 3336
 - speech intelligibility, telephone telemetry, 203 subjects, auxiliary equipment, 3219
 - stapes reflex, 272
 - hearing aid performance, measured, comparison of 4 systems, 3731
- hearing impairment**, age, auditory threshold, hearing, noise pollution, population research, 684

- display system, hearing, shorthand display, 2488
- echo, hearing, speech intelligibility, delayed speech, 2996
- frequency following response, hearing aid, in situ test, acoustic pressure, 1897
- hearing aid, speech intelligibility, binaural, test procedure, 2978
- hearing aid, perception deafness, frequency converter, 1523
- perception deafness, signal noise ratio, speech, speech intelligibility, 1288
- heart, abdomen, echography, image processing, ultrasonics, 3773**
 - artery, blood pressure, model, dog, least energy, 2832
 - artificial heart pacemaker, electrode, electrostimulation, endocardial pacing, rate of electrode displacement 1050
 - biofeedback, circadian rhythm, mathematic model, sweating, 2791
 - computer assisted tomography, gated tomography, 3811
 - computer assisted tomography, heart arrest, heart function, isolated heart, dog, 1604
 - computer assisted tomography, heart infarction, 9 human hearts, in vitro, 1600
 - densitometry, lung cancer, lung cyst, lung emphysema, mediastinum, thorax wall, 33 thoracic tomodesintometers, 1061
 - electrocardiography, heart electric field, magnetic field, magnetocardiography, rectangular and spherical coordinates, 2590
- heart arrest, anesthesia, cost, lung function, medical record, monitoring, operating room, techniques, requirement, 3032**
 - computer assisted tomography, heart, heart function, isolated heart, dog, 1604
- heart arrhythmia, alarm monitoring, computer, 3428**
 - alarm monitoring, computer, computerized arrhythmia alarm system, 780
 - artificial heart pacemaker, electrode, heart atrioventricular block, 22 cases, epicardial screw in electrode, 631
 - artificial heart pacemaker, electromagnetic field, fluoroscopy, interference, external demand pacemaker, 1041
 - artificial heart pacemaker, electromagnetic radiation, tachycardia, radiofrequency pacemakers, 3690
 - computer, his bundle potential, tachycardia, extra stimulus measurement method, 3099
 - computer, heart failure, heart infarction, intensive care, pneumonia, 1031 cases, 3090
 - computer, coronary care unit, electrocardiography, heart infarction, heart ventricle arrhythmia, 2293
 - computer, electrocardiography, heart ventricle extrasystole, counting ectopic beats, 345
 - computer, heart ventricle extrasystole, monitoring, 18 cases, 3056
 - computer, electrocardiography, monitoring, 3054
 - computer, electrocardiography, analysis, 2319
 - coronary care unit, monitoring, nurse, decentralized electrocardiographic display, 2290
 - ectopic beat, electrocardiography, monitoring, outpatient, 2294
 - electrocardiography, statistics, 1863
- heart atrioventricular block, artificial heart pacemaker, electrode, heart arrhythmia, 22 cases, epicardial screw in electrode, 631**
- heart atrioventricular node, heart muscle membrane, heart muscle membrane potential, rabbit, 3302**
- heart atrium, cell membrane permeability, embryo, heart muscle, heart muscle contraction, electrical stimulus changes, chicken, 2411**
 - computer model, heart muscle contractility, heart ventricle, 3147
- heart atrium pressure, blood pressure, pressure control, 2945**
- heart automaticity, heart rhythm, mathematic model, sinus node, weakly coupled relaxation oscillators, 2473**
- heart ball valve prosthesis, extracorporeal circulation, heart valve prosthesis, reflections, 1841**
- heart catheterization, analog computer, digital computer, hemodynamics, information processing, mini computer, 1990**
 - angiocardiology, catheter, embolism, thrombosis, pigtail catheter, different sideholes numbers, catheter comparison, 3754
 - angiocardiology, brachial artery, catheter, 700 cases, 3018
 - arm prosthesis, blood pressure, digital computer, electroencephalography, microprocessor, monitoring, prosthesis, 2685
 - arteriography, arteriotomy, brachial angiography, brachial artery, brain atherosclerosis, carotid artery, neck, 258 cases, 3755
 - blood flow, doppler ultrasound flow meter, deep arteries, 225
 - catheter, electric accident, electrode, heart ventricle fibrillation, conductive catheter, 2594
 - cineangiography, heart left ventricle, heart left ventricle volume, swan ganz catheter, calibration method, 1464
 - computer, hemodynamics, 3097
 - computer, heart output, heart stroke volume, lung artery pressure, lung blood volume, mitral valve stenosis, radiocardiography, mitral valve area, 33 patients, 2754
 - computer, computer assisted diagnosis, echocardiography, heart ventricle pressure,

information processing, 1233

- computer assisted tomography, echocardiography, exercise, oxygen consumption, phonocardiography, invasive and noninvasive evaluation, human subject, 3416

- congenital disease, philips acs, 2211

- electric accident, heart fibrillation, electrode area, stimulus duration, 2210

- electrocardiography, electrode, monitoring, chest lead, radiotransparent electrode, 1548

- fiberoscope, oximetry, photometry, 3240

- fiberoscope, oximetry, oxygen blood level, oxygen saturation, design, 1812

heart contraction, heart fibrillation, mathematic model, rayleigh distribution, 87

- heart left ventricle, heart left ventricle wall, tissue stress, finite element method, 1304

- heart left ventricle wall, mathematic model, fluid dynamics, 2038

heart disease, b scan, congenital heart malformation, echocardiography, echotomography, high speed b mode echocardiography, 500 cases, 1435

- chronic disease, ischemic heart disease, mathematic model, 1703

heart edema, computer assisted tomography, heart muscle ischemia, dog heart, 1219

heart electric field, electrocardiography, heart, magnetic field, magnetocardiography, rectangular and spherical coordinates, 2590

- model, isolated rabbit heart, 3551

heart failure, adenosine triphosphatase, circular dichroism, heart muscle, myosin, electron microscopy, dog, 632

- computer, heart arrhythmia, heart infarction, intensive care, pneumonia, 1031 cases, 3090

- newborn, thermography, 37 newborns, diagnostic methods, 578

heart fibrillation, electric accident, heart catheterization, electrode area, stimulus duration, 2210

- heart contraction, mathematic model, rayleigh distribution, 87

heart function, computer assisted tomography, heart, heart arrest, isolated heart, dog, 1604

heart function test, bicycle ergometry, calculation, oxygen consumption, step test, cylinder, 646

heart index, computer, computer program, heart output, thermodilution curve, on line computation, 850

heart infarction, alarm monitoring, computer, electrocardiography, heart ventricle arrhythmia, 2 computer programs comparison, 1568

- ambulance, emergency, life support system, telemetry, 3292

- automation, computer, heart left ventricle, heart ventricle arrhythmia, automated data processing, 1232

- body posture, electrocardiography, heart rate, st segment, thorax electric field, 35 precordial leads, method, 1049

- brain, digital filtering, image processing, scintigraphy, scintillation camera, thermography, 1929

- brain scintigraphy, computer assisted tomography, scintillation camera, technetium 99m, 25 cases, dog heart infarction, emission computed tomography, maac 99m, 1200

- computer, heart arrhythmia, heart failure, intensive care, pneumonia, 1031 cases, 3090

- computer, coronary care unit, electrocardiography, heart arrhythmia, heart ventricle arrhythmia, 2293

- computer, prognosis, stroke, interactive computer program, 3042

- computer, electrocardiography, 33 cases, polarcardiographic examination of old infarcts, 1165

- computer assisted tomography, heart, 9 human hearts, in vitro, 1600

- coronary artery, radiocontrolled occluder, occluder, 1467

- ectopic beat, heart muscle contraction, inotropism, strain gauge transducer, miniature segment length strain gauge, 2924

- heart movement, heart wall, kymography, non invasive analysis, dog, 3289

- correspondence analysis, 71 patients, 1857

heart left atrium pressure, heart surgery, monitoring, postoperative care, transseptal monitoring, 3299

heart left ventricle, angiography, cast, elasticity, heart muscle, mathematic model, urethan, calculation of young's elastic modulus, 433

- aorta, aorta valve prosthesis, mitral valve prosthesis, model, flow visualization, 920

- artificial heart, baylor pump, implantation, calves, 3296

- artificial heart, assisted circulation, starling law, automatic driving system, 2189

- assisted circulation, dura mater, valve, biolized intrathoracic device, 2188

- automation, computer, heart infarction, heart ventricle arrhythmia, automated data processing, 1232

- automation, echocardiography, performance, ultrasonics, time to voltage analogue, converter, dog, 1455

- blood flow, circulation, hemodynamics, mathematic model, parameter extraction, 469

- blood pressure, heart ventricle pressure, mathematic model, statistics, ape, self modelling, 1712

- cineangiography, heart catheterization, heart left ventricle volume, swan ganz catheter, calibration method, 1464

- computer model, heart muscle, isolated heart, 3 dimensional finite element analysis, 1987

- heart contraction, heart left ventricle wall, tissue stress, finite element method, 1304

heart left ventricle ejection fraction, cineangiocardiology, computer, heart ventricle enddiastolic volume, special purpose calculator, 3477

- computer, heart left ventricle performance, heart scintigraphy, scintiangiocardiography, 25 cases, 2332

- computer, electrocardiography, qrs complex, q wave, r wave, relation qrs forces to left ventricle ejection

fraction, 2699

heart left ventricle ejection time, artery pulse, computer, electrocardiography, heart sound, heart systolic time interval, surgery, pdp 11, real time, 851

- electrocardiography, heart systolic time interval, monitoring, ambulatory interval monitoring, 2194

heart left ventricle hypertrophy, aorta stenosis, aorta valve disease, aorta valve regurgitation, computer, electrocardiography, vectorcardiography, 257 patients, 2323

heart left ventricle performance, computer, heart left ventricle ejection fraction, heart scintigraphy, scintiangiocardiography, 25 cases, 2332

heart left ventricle pressure, heart muscle contractility, primate, waveform, fourier analysis, 2934

heart left ventricle volume, cineangiography, heart catheterization, heart left ventricle, swan ganz catheter, calibration method, 1464

- echocardiography, glyceryl trinitrate, continuous assessment, 28 patients, analog conversion system, 644

heart left ventricle wall, heart contraction, mathematic model, fluid dynamics, 2038

- heart contraction, heart left ventricle, tissue stress, finite element method, 1304

heart lung machine, blood pump, extracorporeal circulation, self regulating pump, 221

heart model, echocardiography, application, 1319

heart movement, echocardiography, spatial movement, cardiophone, 1023

- heart infarction, heart wall, kymography, non invasive analysis, dog, 3289

- radiography, automatic control system, 742

heart murmur, phonocardiography, technique, 2936

heart muscle, adenosine triphosphatase, circular dichroism, heart failure, myosin, electron microscopy, dog, 631

- angina pectoris, image processing, infarction, radioisotope, thallium 201, 2287

- angiography, cast, elasticity, heart left ventricle, mathematic model, urethan, calculation of young's elastic modulus, 433

- calcium 45, sucrose c 14, diffusion in transient and steady state, kittens, 2005

- cell membrane permeability, embryo, heart atrium, heart muscle contraction, electrical stimulus changes, chicken, 2411

- cell membrane potential, light reflection, pulse generator, stimulator, capacitor discharge, frog, 78

- computer, electrostimulation, heart muscle potential, heart ventricle, 860

- computer model, energy transfer, glucose, glycolysis, heart perfusion, nicotinamide adenine dinucleotide, reduced nicotinamide adenine dinucleotide, rat, 1631

- computer model, heart left ventricle, isolated heart, 3 dimensional finite element analysis, 1987

- echography, sound attenuation, ultrasonics, 2656

- electrode, needle electrode, multipolar electrode, beating heart, construction, 2923

- heart papillary muscle, repeat response, rabbit, 3303

- heart ventricle, purkinje fiber, electrical connexion zone, dog, 2080

- hill model, mathematic model, muscle contraction, muscle isometric contraction, analytical solution, 3522

- mathematic model, vector string descriptor, 2831

- model, sliding filament theory, 2054

heart muscle blood flow, arteriovenous shunt, blood flow, heart output, indocyanine green, microsphere ce 141, microsphere sr 85, turkey, dog, 1474

- capillary flow, isotope tracing, model, physiology, theory of tracer washout technique, 2929

heart muscle cell membrane, calcium channel, heart muscle cell membrane potential, heart vulnerable period, sodium channel, 2845

heart muscle cell membrane potential, calcium channel, heart muscle cell membrane, heart vulnerable period, sodium channel, 2845

heart muscle conduction system, computer, heart muscle potential, isolated heart, analysis, dog, 1234

- electric model, electrocardiography, 2076

heart muscle contractility, computer, calculation, cat, 2374

- computer model, heart atrium, heart ventricle, 3147

- heart left ventricle pressure, primate, waveform, fourier analysis, 2934

heart muscle contraction, adenosine triphosphatase, mathematic model, mathematical model, 2424

- cell membrane permeability, embryo, heart atrium, heart muscle, electrical stimulus changes, chicken, 2411

- ectopic beat, heart infarction, inotropism, strain gauge transducer, miniature segment length strain gauge, 2924

- excitation contraction coupling, stimulation rate, frog, 1673

- heart muscle hypertrophy, mathematic model, rat, heart muscle isometric contraction, 889

heart muscle fiber, action potential, heart ventricle, mathematic model, voltage clamp, 938

- calcium channel, procaine, propranolol, sodium channel, verapamil, cat, 2412

- embryo, membrane potential, microelectrode, signal noise ratio, intercellular communication, 1742

- hodgkin huxley equation, mathematic model, nerve fiber membrane, hodgkin-huxley model, 2078

heart muscle hypertrophy, heart muscle contraction, mathematic model, rat, heart muscle isometric contraction, 889

heart muscle ischemia, adenosine, adenosine triphosphate, adenylcyclase, computer model,

- coronary artery blood flow, cyclic amp, hypoxanthine, inosine, noradrenalin, rat, 872
- adenylyclase, computer model, cyclic amp, hypoxanthine, inosine, noradrenalin, phosphodiesterase, vasodilatation, rat, 2452
- computer assisted tomography, heart edema, dog heart, 1219
- ischemic heart disease, mathematic model, ischemic tension development, regionally ischemic heart muscle, 2058
- heart muscle membrane**, heart atrioventricular node, heart muscle membrane potential, rabbit, 3302
- heart muscle membrane potential**, anisotropy, mathematic model, membrane potential, muscle, nerve, syncytium, dog, 3184
 - heart atrioventricular node, heart muscle membrane, rabbit, 3302
- heart muscle oxygen tension**, coronary artery blood flow, coronary artery circulation, mathematic model, coronary bed on inhomogeneity, rat, 3701
- heart muscle potential**, computer, electrostimulation, heart muscle, heart ventricle, 860
 - computer, heart muscle conduction system, isolated heart, analysis, dog, 1234
- heart output**, algorithm, digital computer, stewart hamilton method, 2064
 - aorta balloon, aorta pressure, assisted circulation, blood vessel resistance, hydraulic power, dog, 1859
 - aorta balloon, increased heart output, downstream pumping, reversed unidirectional intra aortic balloon, dog, 1454
 - aorta flow, electromagnetic flowmeter, automatic zeroing base line circuit, 1801
 - arteriovenous fistula, blood flow, hemodialysis, dye dilution method, 15 patients, cimino brescia fistula, 3695
 - arteriovenous shunt, blood flow, heart muscle blood flow, indocyanine green, microsphere ce 141, microsphere sr 85, turkey, dog, 1474
 - artery circumference, artery resistance, blood pressure, mathematic model, measurement method, 3166
 - artery pulse, blood flow, computer model, heart stroke volume, 2065
 - assisted circulation, forward heart failure, oxygen, external counter pulsator, 636
 - assisted circulation, design, 219
 - blood flow, body temperature, mathematic model, skin temperature, transient response, human, thermoregulation, 448
 - cardiography, impedance plethysmography, method, 3691
 - clearance, indicator dilution curve, mathematic model, unified estimation theory, 73
 - computer, thermodilution curve, evaluation flow bench, 3101
 - computer, dye dilution curve, hybrid computer, 3100
 - computer, radioactive microsphere, calculation, pdp 11, 3096
 - computer, heart catheterization, heart stroke volume, lung artery pressure, lung blood volume, mitral valve stenosis, radiocardiography, mitral valve area, 33 patients, 2754
 - computer, computer program, heart index, thermodilution curve, on line computation, 850
 - computer, intensive care, monitoring, 2711
 - dye dilution curve, monitoring, open heart surgery, thermodilution, 633
 - ear densitometer, fibroscope, output measurement, children, 2940
 - exercise, gas exchange, oxygen consumption, output determination, 2201
 - heart stroke volume, heart ventricle pressure pulse, calculation method, 2593
 - impedance plethysmography, plethysmography, thorax, thorax impedance, output computation, 2203
 - thermistor, thermodilution curve, determination, small animal, 1046
- heart papillary muscle**, excitation contraction coupling, heart right ventricle, thermopile, metal film thermopile, rabbit, frog, 2600
 - heart muscle, repeat response, rabbit, 3303
- heart perfusion**, adenosine triphosphatase, computer model, glycogenolysis, glycolysis, hypoxia, lactate permease, rat, 2170
 - computer model, energy transfer, glucose, glycolysis, heart muscle, nicotinamide adenine dinucleotide, reduced nicotinamide adenine dinucleotide, rat, 1631
- heart prosthesis**, prosthetic material, thrombosis prevention, surface characteristics, in vivo, 634
- heart rate**, acceleration, cardiovascular system, headache, mathematic model, stress, 2812
 - action potential, fourier transform, information processing, point process, 71
 - anesthetist, hospital personnel, mental load, operating room, stress, telemetry, 525
 - balneology, duodenum ulcer, exercise, kinesiotherapy, telemetry, czechoslovakia, 522
 - blood pressure, isoprenaline, dog, direct measurement, 2601
 - blood pressure, exercise, heart work, oxygen consumption, rest, automatic measurement, 2753
 - blood pressure, cardi tachometer, electrocardiography, 2917
 - body posture, electrocardiography, heart infarction, st segment, thorax electric field, 35 precordial leads, method, 1049
 - body temperature, circadian rhythm, computer, confinement, walking, sheep, 847
 - body temperature, electromagnetic radiation, hibernation, telemetry, squirrel, 967
 - breathing rate, electrocardiography, lung ventilation, sailor, ship, skin temperature, telemetry, workload, seagoing ship, 524

- cardiography, echography, electrocardiography, fetus heart rate, monitoring, siemens partecust, 325
- cardiachometer, beat by beat meter, 1851
- cardiachometer, digital analog converter, period meter, 1847
- cell membrane, diving, hydrostatic pressure, nerve cell, pacemaker, mouse, rat, guinea pig, rabbit, dog, 365
- computer, electrocardiography, telemetry, one line measurement, bird, 2375
- computer, electrocardiography, exercise test, baseline estimation, 3422
- computer, electrocardiography, exercise, lung function, oxygen consumption, tidal volume, breath-by-breath respiratory measurements, 1615
- computer, monitory, on line statistical analysis, 2713
- computer, electrocardiography, electromyography, ergonomics, error, exercise electrocardiography, quality control, 1164
- electrocardiography, analysis, long term recording, 635
- electrocardiography, rate recording, unrestrained rat, 1042
- exercise, pedometer, portable heartbeat integrator, rate distribution, children, adult, 1846
- fetus heart rate, information processing, labor, microprocessor, 1865
- fourier transform, information processing, 1716
- monitoring, digital instrument, 3034
- pulse frequency modulation, variability analysis method, 993
- variability assessment device, filter design, 1850
- heart rhythm**, heart automaticity, mathematic model, sinus node, weakly coupled relaxation oscillators, 2473
 - information processing, volterra equation, 882
 - mathematic model, phase control, 881
- heart right ventricle**, excitation contraction coupling, heart papillary muscle, thermopile, metal film thermopile, rabbit, frog, 2600
- heart scintigraphy**, computer, heart left ventricle ejection fraction, heart left ventricle performance, scintiangiocardiography, 25 cases, 2332
- heart sound**, artery pulse, computer, electrocardiography, heart left ventricle ejection time, heart systolic time interval, surgery, pdp 11, real time, 851
 - auscultation, phonocardiography, tape recorder, 2198
 - echocardiography, oscillation, phonocardiography, water hammer, theory, 2214
 - kinetocardiography, vibration, electrooptical scanner, 1047
 - microphone, phonocardiography, signal noise ratio, 1058
- heart stimulation**, artificial heart pacemaker, electrode, stimulation threshold, comparative study, thresholds in leads of different size, 640
 - artificial heart pacemaker, electrode, electrode surface area, 1054
 - electrocardiography, endocardium, stimulation threshold, amplitude unipolar endocardial electrogram, 2592
- heart stroke volume**, artery pulse, blood flow, computer model, heart output, 2065
 - computer, heart catheterization, heart output, lung artery pressure, lung blood volume, mitral valve stenosis, radiocardiography, mitral valve area, 33 patients, 2754
 - heart output, heart ventricle pressure pulse, calculation method, 2593
- heart surgery**, angiocardiography, sternum, sternum retractor with radiolucent blades, 1145
 - aspiration, extracorporeal circulation, automatic control device, 3704
 - computer, infusion, intensive care, monitoring, postoperative care, alabama, 2712
 - coronary artery, doppler ultrasound flow meter, ultrasonics, localization of coronary artery, 3689
 - heart left atrium pressure, monitoring, postoperative care, transseptal monitoring, 3299
- heart systolic time interval**, artery pulse, computer, electrocardiography, heart left ventricle ejection time, heart sound, surgery, pdp 11, real time, 851
 - electrocardiography, heart left ventricle ejection time, monitoring, ambulatory interval monitoring, 2194
- heart transplantation**, computer, information processing, pathophysiology, canada, phocar system, 3851
- heart valve**, flow, heart valve disease, heart valve prosthesis, model, flow resistance assessor, 1447
 - heart valve prosthesis, heterograft, pulsatile flow, hancock porcine xenograft, model 242 and 250, 1844
 - heart valve prosthesis, heterograft, pig, 1462
 - heart valve prosthesis, heterograft, 1965-1977, 1461
 - heart valve prosthesis, shear stress, flow, 1855
 - prosthesis, protection by law, 3284
- heart valve disease**, doppler ultrasound flow meter, ultrasonics, 2926
 - flow, heart valve, heart valve prosthesis, model, flow resistance assessor, 1447
- heart valve leaflet**, aorta valve, stress, geometrical data, human valve, 1268
- heart valve prosthesis**, aorta valve, subcoronary ball valve, early experiments, 1842
 - aorta valve prosthesis, aorta left ventricle pulse duplicator, chest model, 643
 - carbon, hemodynamics, hemolysis, pivoting disc prosthesis, carbon model, 1459
 - computer, mathematic model, thrombogenesis, tilting disk prosthesis, thrombogenic site prediction, 1236
 - embolism, thrombosis, quest for perfect valve, 1458
 - extracorporeal circulation, heart ball valve prosthesis, reflections, 1841

- flow, heart valve, heart valve disease, model, flow resistance assessor, 1447
- heart valve, heterograft, pulsatile flow, hancock porcine xenograft, model 242 and 250, 1844
- heart valve, heterograft, pig, 1462
- heart valve, heterograft, 1965-1977, 1461
- heart valve, shear stress, flow, 1855
- heterograft, carpentier edwards mounted xenograft, hancock heart valve, 1468
- hydrodynamics, principles, edinburgh prosthesis, 1059
- pulsatile flow, pressure gradient measurement, 1843
- thrombogenicity, testing, 1463
- smeloff cutter prosthesis, design, 1460
- bjork shiley tilting disk valve, 1457

heart ventricle, action potential, heart muscle fiber, mathematic model, voltage clamp, 938

- biomechanics, fourier transform, functional model, 1664
- computer, electrostimulation, heart muscle, heart muscle potential, 860
- computer model, heart atrium, heart muscle contractility, 3147
- heart muscle, purkinje fiber, electrical connexion zone, dog, 2080

heart ventricle activation, computer, wolff parkinson white syndrome, computer simulation, 2697

heart ventricle arrhythmia, alarm monitoring, computer, electrocardiography, heart infarction, 2 computer programs comparison, 1568

- automation, computer, heart infarction, heart left ventricle, automated data processing, 1232
- computer, coronary care unit, electrocardiography, heart arrhythmia, heart infarction, 2293

heart ventricle enddiastolic volume, cineangiocardiology, computer, heart left ventricle ejection fraction, special purpose calculator, 3477

- clamp, heart ventricle endsystolic volume, heart ventricle pressure, heart ventricle volume, isolated heart, pump, servocircuit, volume clasper, dog, 3290

heart ventricle endsystolic volume, clamp, heart ventricle enddiastolic volume, heart ventricle pressure, heart ventricle volume, isolated heart, pump, servocircuit, volume clasper, dog, 3290

heart ventricle extrasystole, computer, electrocardiography, heart arrhythmia, counting ectopic beats, 345

- computer, heart arrhythmia, monitoring, 18 cases, 3056

heart ventricle fibrillation, catheter, electric accident, electrode, heart catheterization, conductive catheter, 2594

- defibrillation, electrical dose, 100 patients, 2944

- electrode, excitation propagation measurement, animal, 1470

heart ventricle pressure, blood pressure, heart left ventricle, mathematic model, statistics, ape, self modelling, 1712

- blood pressure, echography, gas bubble, ultrasonics, noninvasive measurement, 1471
- clamp, heart ventricle enddiastolic volume, heart ventricle endsystolic volume, heart ventricle volume, isolated heart, pump, servocircuit, volume clasper, dog, 3290
- computer, computer assisted diagnosis, echocardiography, heart catheterization, information processing, 1233

heart ventricle pressure pulse, heart output, heart stroke volume, calculation method, 2593

heart ventricle systole, digital computer, electrocardiography, his bundle potential, 1942

heart ventricle volume, clamp, heart ventricle enddiastolic volume, heart ventricle endsystolic volume, heart ventricle pressure, isolated heart, pump, servocircuit, volume clasper, dog, 3290

heart volume, thorax radiography, inherent mathematical error factor, 3705

heart vulnerable period, calcium channel, heart muscle cell membrane, heart muscle cell membrane potential, sodium channel, 2845

heart wall, heart infarction, heart movement, kymography, non invasive analysis, dog, 3289

heart work, blood pressure, exercise, heart rate, oxygen consumption, rest, automatic measurement, 2753

- energy transfer, mathematic model, thermodynamics, 1678

heat clearance, body temperature, calorimetry, microwave radiation, radiation hazard, mice, 2433

heat conduction, diffusion, nonlinear system, thermodynamics, diffusion equation, 1280

heater, cooling system, peltier effect, temperature control, dc proportional temperature controller, 2173

- dosimetry, function generator, thermoluminescence, heating rate, 592
- mirror, wall mounted mirror warmer, 3207

heat exchanger, refrigerator, dilution refrigerator, 3618

- thermogenesis, thermoregulation, intravascular exchanger, goat, 451

heating, electromagnetic radiation, microwave radiation, thyroid gland, thyroxine, triiodothyroxine, dog, 2566

heat loss, model, respiration, water loss, predictive model, kangaroo rat, 1279

heat radiation, burn, evaporation, mathematic model, skin, temperature distribution, 2040

heat transfer, body, homeothermia, mathematic model, newborn, thermoregulation, body insulation, critical size, 897

- temperature, thermography, gradient in low flow vessel, 3200
- thermodynamics, tissue, 3153

heavy particle radiation, argon, dosimetry, tissue equivalent, 726

- dosimetry, ionization chamber, thermoluminescence dosimeter, x ray film, radiation activation detector, radiobiological experiment, 1342
- heel**, embolism prevention, postoperative complication, support, thrombosis prevention, heel support device, 2925
- helicopter**, ambulance, army, mobile emergency life support, special training, denmark, 606
 - ambulance, emergency health service, rescue personnel, german federal republic, equipment, 5 yrs experience, ulm, 3569
- helicopter pilot**, aviation, bone density, skeleton, vibration, skeletal system, response, 3010
- helium**, carbon dioxide, carbon monoxide, fluoride, gas diffusion, lung diffusion, mathematic model, oxygen, binary diffusion coefficient, 2828
 - carbon dioxide, diving, dyspnea, exercise, functional residual capacity, hyperbarism, lung volume, 49.5 at 6 divers, 1298
 - carbon monoxide, lung diffusion, sulfur hexafluoride, 3163
 - gas chromatography, inert gas, gas measurement, 3636
 - gas diffusion, gas mixing, nitrogen, oxygen, water vapor, binary and ternary diffusion, 1295
- helmet**, accident, head trauma, crash impact response, nonlinear numerical prediction, 2809
 - epilepsy, face injury, protective head gear, 1111
- hemangioblastoma**, brain angiography, brain tumor, cerebellum tumor, computer assisted tomography, ependymoma, medulloblastoma, 22 children, 3455
 - cerebellum, computer assisted tomography, spinal cord, von hippel lindau disease, case report, 3073
- hemangioma**, argon laser, spider nevus, 17 lesions in 16 patients, 2897
 - brain angiography, brain hemangioma, computer assisted tomography, 6 cases, 806
 - choroid tumor, computer assisted tomography, 3 cases, diagnosis, 765
 - computer assisted tomography, exophthalmos, meningioma, myositis, tumorous and nontumorous exophthalmos, 90 cases, 802
- hematocrit**, automation, circadian rhythm, hemoglobin, leukocyte count, thrombocyte count, differential count, hemalog d, 3685
 - blood viscosity, capillary permeability, mathematic model, serum protein, 3541
 - erythrocyte, erythrocyte flow, tube flow, narrow tube, 2055
- hematology**, anemia, computer assisted diagnosis, computer teaching, model, computer vs non computer, france, 2690
 - computer assisted diagnosis, 3802
 - mathematic model, gamma radiation, radioisotope, scintigraphy, 2465
- hematoma**, brain edema, cerebrospinal fluid, electroencephalography, head trauma, intracranial hypertension, tumor, cat, epidural pressure measurement, 1076
 - brain hemorrhage, computer assisted tomography, ring blush, 7 cases in 58, 362
 - brain tumor, cerebrospinal fluid, electrocardiography, electroencephalography, intracranial hypertension, pneumoencephalography, telemetry, 20 cases, continuous recording, technique, 1487
 - computer assisted tomography, hydrocephalus, subdural hygroma, postoperative evaluation, 3813
- hematopoietic disease**, biofeedback, cheyne stokes breathing, chronic granulocytic leukemia, mathematic model, nonlinear system, process control, respiration, 1299
- hemianopia**, age, brain cortex, computer assisted tomography, hemiparesis, partial epilepsy, temporal lobe epilepsy, 11 out of 500 children, 788
 - computer assisted tomography, craniopharyngioma, exophthalmos, orbit, subarachnoid cyst, boy of 7, 2733
- hemiparesis**, age, brain cortex, computer assisted tomography, hemianopia, partial epilepsy, temporal lobe epilepsy, 11 out of 500 children, 788
 - cerebral palsy, electromyography, gait, muscular dystrophy, telemetry, temporal information, 100 cases, 1904
- hemiplegia**, cerebral palsy, electrostimulation, movement, orthosis, paralysis, actual situation, problem, 713
 - computer assisted tomography, gaze paralysis, miosis, thalamus hemorrhage, 18 cases, 814
- hemisphere**, cognition, imagination, nerve cell, nerve cell network, perception, visual cortex, visual nerve cell, model, 86
 - electroencephalography, frequency analysis, cat, 1878
- hemochromatosis**, computer assisted tomography, hemosiderosis, liver, excessive iron storage, 14 patients, 12 healthy controls, 803
- hemodialysis**, arteriovenous fistula, blood flow, heart output, dye dilution method, 15 patients, cimino brescia fistula, 3695
 - artificial kidney, dialysate recycle, 3320
 - artificial kidney, adsorption system, design analog, 3319
 - artificial kidney, hemoglobin, leak detector, 70
 - artificial kidney, wearable kidney, instrumentation, 663
 - artificial kidney, lundia mini minor, disposable dialyzer, child, 662
 - artificial kidney, dialysis membrane, progress in 20 years, 3720
 - artificial kidney, compact travel dialysis system, 1877

- artificial kidney, cellophane, cellulose membrane, cuprophane, hemodialysis membrane, ion exchange, 1875
- artificial kidney, mathematic model, tubular haemodialyses, ultrafiltration, dialysate concentration, 2226
- artificial kidney, parallel plate dialysis, clinical performance, 2225
- artificial kidney, membrane support, parallel plate dialyses, 2224
- artificial kidney, carbon 14, cold carbon apparatus, 2223
- blood, ultrafiltration, design analysis, model, 620
- cerebrospinal fluid pressure, kidney failure, mathematic model, urea, treatment guideline, 477
- compartment model, creatinine blood level, mathematic model, peritoneal dialysis, urea blood level, uremia, 3169
- stainless steel, ultrafiltration, microcapillary system, 1485
- hemodialysis membrane**, artificial kidney, cellophane, cellulose membrane, cuprophane, hemodialysis, ion exchange, 1875
- hemodynamics**, analog computer, digital computer, heart catheterization, information processing, mini computer, 1990
 - aneurysm, model, fusiform model, 474
 - aneurysm, model, 468
 - aorta stenosis, artery wall compliance, mitral valve regurgitation, model, hydraulic model, factors affecting transvalvar pressure, gorlin formula, 917
 - artery flow, mathematic model, pulsatile flow, 2060
 - artery occlusion, doppler ultrasound flow meter, pulsatile flow, hydrodynamic bench, 3167
 - artificial heart, cause of death, long term effect, calf, 1853
 - assisted circulation, coronary care unit, electrocardiography, fluoroscopy, monitoring, 3353 patients, 30 bed coronary care unit, 217
 - assisted circulation, intracorporeal left ventricular assist device, 8 patients, 2205
 - blood flow, circulation, heart left ventricle, mathematic model, parameter extraction, 469
 - blood vessel catheterization, model, 638
 - carbon, heart valve prosthesis, hemolysis, pivoting disc prosthesis, carbon model, 1459
 - cava vein blood flow, inferior cava vein, vein blood flow, human, 924
 - computer, heart catheterization, 3097
 - computer, echocardiography, m mode, 1986
- hemoglobin**, arteriovenous oxygen difference, oxygen blood level, spectrophotometry, flowing whole blood esophagus, 1002
 - artificial kidney, hemodialysis, leak detector, 70
 - automation, circadian rhythm, hematocrit, leukocyte count, thrombocyte count, differential count, hemalog d, 3685
 - blood rheology, carbon dioxide, gas diffusion, mathematic model, oxygen, ph, 1307
 - cuvette, oximetry, photometry, wedge cuvette, 2141
 - diffusion, myoglobin, oxygen, facilitated diffusion, 466
- hemolysis**, carbon, heart valve prosthesis, hemodynamics, pivoting disc prosthesis, carbon model, 1459
 - hypotonic solution, subsecond to second range, hemolysis rate, human erythrocyte, 2181
- hemopoietic cell**, cell culture, cyclotron, fast neutron radiation, fibroblast, leukemia cell, gamma radiation, relative biologic effectiveness, radiologic calibration program, hamster, human fibroblast, mouse, guinea pig, 2094
- hemosiderosis**, computer assisted tomography, hemochromatosis, liver, excessive iron storage, 14 patients, 12 healthy controls, 803
- henle loop**, diuresis, hydropenia, kidney medulla, kidney tubule, mathematic model, urea, human kidney, 2460
- hepatitis b antigen**, ausab procedure, 1154
- hepatography**, computer assisted tomography, liver cancer, liver cyst, pancreas disease, 120 cases, whole body tomography, 831
- hereditary cerebellar ataxia**, computer assisted tomography, spinocerebellar degeneration, woman of 61, 3066
- heroin**, correlation function, drug dependence, family psychiatry, statistics, 3494
- herpes zoster**, acantholysis, chickenpox, immunosuppression, staining, vesiculo bullous disorders, paragon multiple stain, 500
 - nerve stimulation, neuralgia, pain, phantom pain, thalamus, 46 cases, electrode placement, 249
- heterograft**, heart valve, heart valve prosthesis, pulsatile flow, hancock porcine xenograft, model 242 and 250, 1844
 - heart valve, heart valve prosthesis, pig, 1462
 - heart valve, heart valve prosthesis, 1965-1977, 1461
 - heart valve prosthesis, carpentier edwards mounted xenograft, hancock heart valve, 1468
- hexadecane**, lipid, membrane capacitance, protein, bilayer membrane, membrane physical chemistry, 3629
- hibernation**, body temperature, electromagnetic radiation, heart rate, telemetry, squirrel, 967
- higher nervous system activity**, learning, mathematic model, neural theory, 930
- high pass filter**, evoked acoustic nerve response, evoked brain stem response, tone burst, response amplitude, 3323

- hill model**, heart muscle, mathematic model, muscle contraction, muscle isometric contraction, analytical solution, 3522
- hip**, electromyography, ligament, mathematic model, forces evaluation, 437
- femur, fracture, implant, joint total replacement, mathematic model, prosthesis, 3131
 - lubricating agent, lubrication, prosthesis, synovial fluid, total hip prosthesis, 3145
 - pressure transducer, human cadaver joint, local pressure measurement, 3144
- hip arthrosis**, bone strength, ball deformation system, strength flow, 1135 cases, 2034
- hip bone**, biomechanics, bone, compact bone, pelvis, bone stress evaluation, 3148
- hippocampus**, behavior, computer, electrocardiography, behavior quantification, 2758
- brain cortex, electrocardiography, hippocampus potential, mathematic model, dorsal hippocampus slope, 2476
 - excitatory postsynaptic potential, granular cell, information science, prediction of information theory, 2088
 - granular cell, information science, mathematic model, nerve cell, synapse, information theory, 2081
 - mathematic model, nerve cell network, nerve cell potential, ca sub 3, 3192
- hippocampus potential**, brain cortex, electrocardiography, hippocampus, mathematic model, dorsal hippocampus slope, 2476
- hip prosthesis**, ceramics, metal, total hip prosthesis, 30 patients, 278
- hippuric acid i 125**, clearance, scintillation camera, method, 1874
- computer, renal plasma flow, scintillation camera, rat, 1069
- his bundle electrogram**, electrocardiography, measurement device, 1045
- his bundle potential**, computer, heart arrhythmia, tachycardia, extra stimulus measurement method, 3099
- digital computer, electrocardiography, heart ventricle systole, 1942
 - electrocardiography, high frequency ecg, external recording, dog, 2200
- histamine**, air flowmeter, airway obstruction, bronchial asthma, forced expiration, simple device, 3710
- bulla, exudate, inflammation, kinin, prostaglandin, skin, recovery, method, 3363
- histogenesis**, brain malformation, brain tumor, computer assisted tomography, congenital malformation, organogenesis, skull defect, computed tomography, indication, 1223
- histogram**, action potential, microelectrode, window discriminator, time amplitude discriminator, 2238
- automation, chromosome analysis, computer analysis, mitosis, automated classification, 2300
 - calculator, microcomputer, nerve cell potential, 2234
 - image processing, 3778
 - reaction time, histogram generation device, 3725
- histopathology**, cardiology, data base, information processing, pathology, respiration, ssis, 3087
- computer, microscopy, optical marker, microscopy data, quantitative analysis, 983
 - glomerulopathy, information processing, statistics, cluster analysis, 2959
- history**, attitude, computer, patients attitudes, 2311
- computer, diagnosis, u.k., 2312
 - computer interface, digital computer, information processing, voice response system, 1160
- HL A antigen**, antilymphocyte serum, lymphocyte, tissue typing, command processor, 2297
- hodgkin disease**, algorithm, cancer chemotherapy, drug dose, pharmacotherapy, oncology center, 351
- filter, radiotherapy, roentgen dose distribution, tissue compensating filter, moire topography, 307
- hodgkin huxley equation**, cell membrane permeability, mathematic model, nerve cell membrane, complex admittance, squid, 2841
- colon tenia, electricity, mathematic model, smooth muscle, smooth muscle tone, guinea pig, 2037
 - excitable membrane, impedance, membrane impedance, 2839
 - heart muscle fiber, mathematic model, nerve fiber membrane, hodgkin-huxley model, 2078
 - mathematic model, nerve fiber membrane capacitance, squid, 2840
 - nerve cell membrane, nerve cell membrane capacitance, nerve cell potential, renshaw cell, time, repetitive firing, model, 1724
 - nerve fiber, nerve fiber membrane potential, synapse, white noise, squid, 933
 - nerve fiber, nerve fiber membrane potential, model modifications, crab, 495
 - nerve fiber membrane potential, sodium channel, tetrodotoxin, 931
 - pacemaker nerve cell, phase control, 1730
- holography**, camphorquinone, image processing, light absorption, organic medium, 128
- color vision, image processing, color holography, 3588
 - computer assisted tomography, 3 dimensional display, 1961
 - correlation function, pattern recognition, optical correlation, 1784
 - digital computer, display system, stereoscopy, 545
 - echography, holoscan, 1024
 - eye, method, instrumentation, long wave holography, optical holography, 1101
 - fourier transform, image processing, deconvolution method, 1367
 - fourier transform, roentgen radiation, 4.48 nm xrays, 1125
 - image processing, photography, 132
 - image processing, 3 dimensional image, 131

- memory, associative memory chains, 1881
- photometry, double beam photometer, serum dna, 1366
- projector, multi color image, 2116
- signal noise ratio, vibration, vibration analysis, 573
- homeothermia**, body, heat transfer, mathematic model, newborn, thermoregulation, body insulation, critical size, 897
- homoprotocatechuic acid**, brain, enzyme, microwave radiation, radiation hazard, rat, 3628
- hormone**, cell kinetics, cell proliferation, estrogen therapy, population model, mice, 2406
- horseradish peroxidase**, axoplasm flow, hypothalamus, simple injection device, nanolitre volume, 2961
- hospital**, air pollution, odor, olfactometry, emission analysis, 992
 - anesthesiology, automotive exhaust, operating room, scavenging system, mechanical aspects, 3393
 - bioengineering, cost effectiveness, medical instrumentation, 450 beds hospital, 1621
 - clinical laboratory, computer, cost, 3405
 - computer, information processing, kulmbach hospital, 3414
 - computer, drug, drug cost, drug prescription, nurse, pharmacy, physician, ctl modular 1 computer, 3049
 - coronary care unit, electric accident, emergency ward, intensive care, labor room, operating room, recovery room, safety, maryland lutheran hospital, 502
 - education, medical engineering, paramedical education, internship approach, 2382
 - education, medical engineering, paramedical education, usa, 2381
 - electric accident, monitoring, 100
 - electric accident, electric device, medical engineering, monitoring, power supply, electrical plug, safety precaution, 1138
 - intensive care, medical staff, 197
 - maladjustment, medical record, mental disease, neuroleptic agent, schizophrenia, adolescent, 2369
 - medical engineering, medical instrumentation, 861
- hospital admission**, computer, 2308
- hospital engineering**, cost, medical engineering, medical instrumentation, 300 bed, 500 bed hospital, 11 cleveland hospitals, 1241
- hospital laboratory**, gamma counting, iodine 125, radioimmunoassay, 3250
- hospital management**, computer, medical record, uk, nhs, 3089
 - computer, patient, real time, london hospital project, 2687
 - computer model, mathematic model, nursing home, marker chain model, 1150
 - computer program, medical record, public health service, mumps, 2747
 - computer program, medical record, public health service, mumps, 2746
 - computer program, information processing, medical record, public health service, mumps, u.s.a., 2745
 - drug cost, costs, gfr, 3043
- hospital personnel**, anesthetist, heart rate, mental load, operating room, stress, telemetry, 525
 - medical record, mental hospital, training, problem oriented record, 2370
- hospital running cost**, disposable, economy, surgery, disposable products in surgery, usa, 198
- hospital service**, computer program, information processing, medical record, capo program, canada, 1980
 - data base, documentation, information processing, literature, public health service, network, heclinet system, gfr, 1228
- hot climate**, gas detection, tube, extreme conditions, 2552
- hot wire anemometry**, anemometry, thermometer, 546
- human body**, acceleration, model, vibration, human body, reaction to external forces, 2677
- human factors research**, accident, fatigue, industry, safety, human error, pattern analysis, ortho oblique type binary data decomposition, 717
- human serum albumin i 131**, flow, indicator dilution curve, iodine 125, tube, branching network, 1708
- humidity chamber**, 2534
- hunger**, body weight, computer model, satiety, review, computer simulation, control mechanism, 867
- hyaluronidase**, carotid artery, clostridiopeptidase a, elasticity, iodoacetate sodium, model, noradrenalin, pancreatopeptidase e, sodium cyanide, maxwell model, voigt model, 1656
- hybrid computer**, analog computer, standards, 2384
 - computer, dye dilution curve, heart output, 3100
- hydrocephalus**, brain, brain hemorrhage, electricity, electric trauma, pneumoencephalography, subarachnoid hemorrhage, cat, dog, man of 25, 239
 - brain arachnoid cyst, computer assisted tomography, pneumoencephalography, sella turcica, third brain ventricle, case report, man of 19, neurosurgery, 1588
 - brain atrophy, brain hemorrhage, computer assisted tomography, head trauma, skull fracture, subdural hematoma, trauma, diagnosis, 1581
 - brain blood flow, brain infarction, brain scintigraphy, brain tumor, camera, scintillation camera, subdural hematoma, method, diagnosis, 190
 - brain contusion, cerebrovascular disease, computer assisted tomography, glioblastoma, meningioma, 1215
 - brain edema, brain ventricle, cerebrospinal fluid, computer assisted tomography, ependyma, 4 patients,

- transpendymal csf absorption, 2736
- brain hematoma, brain tumor, computer assisted tomography, headache, head trauma, mental deficiency, seizure, 795
- brain ischemia, computer assisted tomography, head trauma, 457 cases, 833
- brain tumor, computer assisted tomography, pneumoencephalography, 725 scans, 757
- brain ventricle, computer assisted diagnosis, computer assisted tomography, volume determination, 805
- brain ventricle, cerebrospinal fluid shunting, computer assisted tomography, porencephaly, 4 cases, motor deficit, 1575
- cerebrospinal fluid, computer assisted tomography, normotensive hydrocephalus, penthanil yb 169, scintiscisternography, subarachnoid hemorrhage, 54 cases, 2721
- computer assisted tomography, hematoma, subdural hygroma, postoperative evaluation, 3813
- computer assisted tomography, treatment, follow up, 1583
- computer assisted tomography, pneumoencephalography, porencephaly, children, 1210
- computer assisted tomography, macrocrania, 93 children, 3764
- hydrochloric acid**, air pollution, carbon monoxide, hydrofluoric acid, infrared radiation, nitrogen oxide, sulfur dioxide, 233
- hydrocortisone**, aldosterone, correlation function, corticosterone, plasma renin activity, 1654
- hydrodynamics**, heart valve prosthesis, principles, edinburgh prosthesis, 1059
- mathematic model, semicircular canal, utricle, fluid flow, 440
- hydrofluoric acid**, air pollution, carbon monoxide, hydrochloric acid, infrared radiation, nitrogen oxide, sulfur dioxide, 233
- etching agent, glass electrode, micropipette, tip etching, 2539
- hydrogen**, brain blood flow, compartment model, measurement, 1055
- nuclear magnetic resonance, tomography, phantom, rat, 3638
- hydrogen discharge**, lamp, monochromator, vacuum, 1817
- hydrogen ion**, antimony, bicarbonate, buffer, carbon dioxide, carbon dioxide tension, microelectrode, oxygen tension, antimony microelectrode, 165
- hydronephrosis**, computer assisted tomography, kidney arteriography, kidney cancer, kidney cyst, 70 cases, 823
- hydropenia**, diuresis, henle loop, kidney medulla, kidney tubule, mathematic model, urea, human kidney, 2460
- hydrophone**, underwater sound, lorentz force, 2909
- underwater sound, 1427
- selection, 386
- hydrostatic pressure**, cell membrane, diving, heart rate, nerve cell, pacemaker, mouse, rat, guinea pig, rabbit, dog, 3692
- cell membrane permeability, epithelial cell, kidney tubule, osmotic pressure, 387
- 5 hydroxytryptophan**, alertness, computer, electroencephalography, electromyography, levodopa, rem sleep, sleep spindle, stage 3 sleep, automatic classification, cat, 1620
- hygroma**, brain hematoma, brain stem contusion, coma, computer assisted tomography, head trauma, 1000 consecutive patients, 1582
- hygrometer**, evaporation, water loss, dew point hygrometry, pigeon, 2174
- hyperbaric oxygen**, hyperbaric chamber, 503 patients, 3789
- hyperbarism**, body temperature, diving, telemetry, dog, 1000 fsw, 3582
- carbon dioxide, diving, dyspnea, exercise, functional residual capacity, helium, lung volume, 49.5 ata, 6 divers, 1298
- first aid, resuscitator, 3 types, comparison, reliability, 320
- hyperparathyroidism**, computer assisted tomography, mediastinum, neck, parathyroid adenoma, 10 cases, 797
- hypertension**, antihypertensive agent, computer, physician, prospective controlled study, 116 patients, 849
- atherosclerosis, capillary flow, diabetes mellitus, microscopy, skin capillary, television, vital television capillary microscopy, 3285
- brain blood flow, cerebrospinal fluid, 91 newborn infants, aplanation measurement, 2227
- brain hematoma, brain stem compression, cerebellum hemorrhage, computer assisted tomography, neurosurgery, 10 cases, 3827
- hyperthermia**, body temperature, dopamine, electric field, hypothalamus, microwave radiation, noradrenalin, serotonin, rat, 2579
- cancer, thermometry, localized hyperthermia, 3525
- diathermy, electromagnetic field, electromagnetic radiation, microwave radiation, physiotherapy, 2178
- hyperthyroidism**, computer assisted diagnosis, 359 patients, 763
- computer assisted tomography, echooculography, neuropathy, orbit cancer, orbit nerve, orbit tumor, 144 cases, 1221
- hyperventilation**, electrocardiography, electrode, exercise electrocardiography, medical instrumentation, quality control, standards, task force, 3291
- hypnosis**, acupuncture, pain, signal detection theory, 12 volunteers, report criterion, 1079
- hypobaric chamber**, erythropoietin, hypoxia, 1349
- hypophysis**, analog computer, hypothalamus, thyroid gland, thyrotropin, thyroxine, simulator, 1148

- hypophysis adenoma**, acoustic nerve neurinoma, chordoma, computer assisted tomography, skull base, 801
- aneurysm, endoscopy, lumbar disk, sella turcica, telescope, endoscopy, apparatus, neurosurgery, hopkins telescope, 666
- astrocytoma, brain tumor, central nervous system metastasis, computer assisted tomography, craniopharyngioma, meningioma, 1658 cases, 817
- brain angiography, computer assisted tomography, pneumoencephalography, 12 cases, 792
- brain tumor, computer assisted tomography, diatrizoate, glioma, meningioma, non contrast scanning, 299 cases, 3457
- computer assisted tomography, parasellar tumor, sella turcica, empty sella, 1188
- hypophysis tumor**, brain angiography, brain tumor, computer assisted tomography, ophthalmology, parasellar tumor, pneumoencephalography, sella turcica tumor, false negative diagnosis, 4 cases, 818
- hypothalamus**, analog computer, hypophysis, thyroid gland, thyrotropin, thyroxine, simulator, 1148
- axoplasm flow, horseradish peroxidase, simple injection device, nanolitre volume, 2961
- body temperature, dopamine, electric field, hyperthermia, microwave radiation, noradrenalin, serotonin, rat, 2579
- brain, brain cortex, copper, electromagnetic radiation, iron, magnesium, potassium, sodium, zinc, 1600 mhz, rat, 2564
- brain depth recording, micropipette, recording barrel, method description, guinea pig, 3268
- hypotonic solution**, hemolysis, subsecond to second range, hemolysis rate, human erythrocyte, 2181
- hypoxanthine**, adenosine, adenosine triphosphate, adenylcyclase, computer model, coronary artery blood flow, cyclic amp, heart muscle ischemia, inosine, noradrenalin, rat, 872
- adenylcyclase, computer model, cyclic amp, heart muscle ischemia, inosine, noradrenalin, phosphodiesterase, vasodilatation, rat, 2452
- hypoxia**, adenosine triphosphatase, computer model, glycogenolysis, glycolysis, heart perfusion, lactate permease, rat, 2170
- anesthesia, computer, electroencephalography, frequency analyzer, microprocessor, minicomputer, monitoring, display system, cerebral function analyzer monitor, 3805
- erythropoietin, hypobaric chamber, 1349
- fetus, mathematic model, oxygen consumption, placenta, uterus contraction, 205
- gas diffusion, gas exchange, myoglobin, tissue cylinder, 2450
- hysteresis**, evoked cortical response, evoked visual response, mathematic model, photostimulation, 2464
- lung alveolus, lung alveolus surfactant, lung pressure, lung volume, mathematic model, 2808
- hysteroscopy**, implantation, occlusion, uterine tube, uterus, steerable hysteroscope, transcervical occlusion, 1067
- ice**, deoxyribonucleic acid, electron transport, fast electron radiation, 3204
- identification**, information science, mathematic model, retina, system analysis, 2045
- ileostomy**, colostomy, magnet, erlangen magnetic closure system, 113 cases, 1835
- ileum**, electrostimulation, intestine, stimulation device, rat, mechanical stimulation, 2179
- illumination**, calcium, photoreceptor, visual cell, activity change, cattle, 458
- eye surgery, microscopy, stereoscopic vision, new instrument, 3038
- mathematic model, retina horizontal nerve cell, synapse, uniform illumination, 493
- illusion**, law, perception, vision, mathematic model, stability, 3161
- image**, roentgen radiation, transducer, charge-coupled device, 1778
- image converter**, radiography, solid state converter screen, 313
- image display**, cell shape, computer analysis, pattern recognition, microscopic image, interactive measurements, program system, 2298
- computer assisted tomography, graphic display system, 1975
- computer assisted tomography, digital display system, 3832
- display system, scintiscanning, 3671
- image intensifier**, autoradiography, radiography, thiourea, image improvement, underexposed radiography, 3391
- cineradiography, moving object, 3379
- fiberoscope, radiography, image contrast, 1916
- fluoroscopy, radiography, calibration, 1534
- frequency analysis, quantum mottle, 3759
- magnesium fluoride, radiation, 312
- modulation transfer function, radiography, tube lens, 2285
- modulation transfer function, resolution, microchannel plate image intensifier, 3022
- night blindness, retina pigment degeneration, visual aid, 1516
- photography, radiography, miniaturization, 2281
- radiography, roentgen radiation, image contrast, sienens pantoskop 3, 1532
- radiography, roentgen radiation, 3772
- roentgen radiation, television, roentgen diffraction, 3786
- spectrometry, 2149

- high speed, evaluation, 1535
- image processing**, abdomen, echography, heart, ultrasonics, 3773
 - ad converter, computer interface, digital computer, scintigraphy, scintillation camera, 3014
 - algorithm, signal noise ratio, vision, visual resolution, 1925
 - algorithm, fourier transform, 3514
 - algorithm, computer assisted tomography, fourier transform, 2342
 - algorithm, smoothing algorithm, 2674
 - angina pectoris, heart muscle, infarction, radioisotope, thallium 201, 2287
 - angiography, computer, x ray film, system, 3840
 - angiography, blood vessel, methods comparison, 737
 - autoradiography, photography, 535
 - aviation, graphology, pattern recognition, photography, 1695
 - brain, digital filtering, heart infarction, scintigraphy, scintillation camera, thermography, 1929
 - brain tumor, computer assisted tomography, digital display, 1590
 - camera, pattern recognition, 3589
 - camphorquinone, holography, light absorption, organic medium, 128
 - cancer, computer model, information processing, scintigraphy, normal brain, 2341
 - cardiography, echocardiography, echography, ultrasonics, real time conversion, 1052
 - cat, computer program, feature extraction, 3777
 - cell, cytology, fourier transform, uterine cervix cytology, 2511
 - cell membrane, cell shape, protein, roentgen radiation, electron microscopy, 3221
 - coding, data reduction, 15
 - color vision, holography, color holography, 3588
 - computer, radiography, image storage, image retrieval, roentgen tele data system, 1595
 - computer, nuclear medicine, 3465
 - computer, digital computer, information processing, scintigraphy, 1576
 - computer assisted tomography, review, 1977
 - computer assisted tomography, 1970
 - computer assisted tomography, digital filtering, scintigraphy, e filter, 2 dimensional filter, 825
 - computer assisted tomography, fourier transform, gamma radiation, scintigraphy, 1218
 - computer assisted tomography, roentgen radiation, 1217
 - computer assisted tomography, scintigraphy, signal noise ratio, image restoration, 2362
 - computer assisted tomography, fourier transform, 368
 - computer assisted tomography, image blur, deblurring, 367
 - computer assisted tomography, singular value decomposition, 366
 - computer assisted tomography, sampling, arbitrary sampling, 3779
 - computer assisted tomography, radiography, roentgen radiation, scintigraphy, scintillation camera, calculus, 2348
 - computer assisted tomography, pattern recognition, shape discrimination, circle transform, 2339
 - computer assisted tomography, radiography, 3782
 - computer memory, minicomputer, television camera, 2514
 - computer model, image quality, radiography, resolving power, siemens star, artifacts, 316
 - conization chamber, multiwire chamber, roentgen radiation, 314
 - cytology, fourier transform, pattern recognition, microscopy, 3596
 - data transmission, telemetry, wave guide, 3218
 - data transmission, fourier transform, projection, 979
 - data transmission, signal noise ratio, telephone telemetry, television, 1930
 - densitometry, minicomputer, television, 124
 - digital computer, minicomputer, image restoration, one line computation, 1369
 - digital computer, echography, nuclear magnetic resonance, radiography, reprography, thermography, 3459
 - digital computer, microprocessor, array processor, 1793
 - digital computer, display system, electron microscopy, 3 d display, 2498
 - digital computer, photometry, stereoscopic vision, vision, 3647
 - display system, nuclear magnetic resonance, 582
 - doppler ultrasound flow meter, fourier transform, signal processing, convolution method, 3028
 - echocardiography, echography, ultrasonics, digital image focusing, 1026
 - echography, ultrasonics, 2660
 - echography, ultrasonics, acousto electronic lens, 2269
 - echography, ultrasonics, 1914
 - echography, ultrasonics, transducer array, 3784
 - filtering, information processing, charge coupled device, 3602
 - fluoroscopy, fourier transform, modulation transfer function, mottle analysis, intensifying screen, power spectrum, 498
 - focal point, radiography, roentgen tube, 317

- fourier transform, microscopy, pattern recognition, mellin transfer, 1008
- fourier transform, discrete transformation, 1541
- fourier transform, holography, deconvolution method, 1367
- fourier transform, nuclear magnetic resonance, element analysis, 2873
- fourier transform, positron camera, radioisotope, positron annihilation, 728
- fourier transform, pattern recognition, shape discrimination, 1777
- fourier transform, spectrometry, phase spectrum, walsh transform, 1530
- histogram, 3778
- holography, photography, 132
- holography, 3 dimensional image, 131
- infrared radiation, hadamard transform, 534
- infrared radiation, spectrometry, image dissection, 579
- iodine 123, scintigraphy, scintillation camera, 729
- laser, microscopy, scanning microscopy, 2505
- lung, microwave radiation, respiration, 2286
- microprocessor, review, 1931
- microscopy, contrast microscope, 1363
- microscopy, scanning microscopy, 1785
- microwave radiation, millimeter wave, 1012
- motion picture, scintiscanning, film choice, 2571
- nuclear magnetic resonance, proton image, 3776
- optical lens, radiography, scintigraphy, fresnel zone plate, 2512
- photography, image quality, 1781
- photography, vision, mosaic picture, 1774
- photography, radiography, tomography, camera, photographic reconstruction, 3787
- position transducer, touch, tactile imaging, 980
- gamma radiation, radioisotope, scintigraphy, 1918
- gamma radiation, radiocardiography, radioisotope, scintigraphy, technetium 99m, 3378
- radiation scattering, radiography, new grid, 3374
- radiography, image storage, image retrieval, 1538
- radiography, roentgen radiation, visual system, soft roentgen radiation, mirror, 3027
- signal noise ratio, signal dependent noise, 1927
- signal noise ratio, image expansion, 3595
- spectrometry, motion blur, 134
- spectrometry, ion scattering, 2872
- television, 3592
- ultrasonics, detector array, review, 2270
- videorecording, basics, videodisc, 2504
- videorecording, 2500
- image blur, convolution method, 310
- image restoration, 309
- image quality, 130
- deblurring, 1926
- sectioned restoration, map restoration, 3774
- smear correction, 3591
- defocused picture, 1365
- spline function, 2503
- map restoration, 3775
- image production**, computer assisted tomography, polaroid image, 1178
 - model, radiography, statistics, unified view of imaging system, 1923
 - multidimensional tomography, tomography, reconstruction from sinogram, 3385
- image quality**, computer model, image processing, radiography, resolving power, siemens star, artifacts, 316
 - computer model, radiography, 939
 - focal point, magnification radiography, modulation transfer function, 724
 - focal point, magnification radiography, model, modulation transfer function, 723
 - focal point, magnification radiography, model, modulation transfer function, 722
 - magnification radiography, skeleton roentgenography, 180 cases, 734
 - modulation transfer function, tomography, 2310
 - radiation exposure, radiography, image information content, patient exposure, 2853
 - radiography, roentgen radiation, total unsharpness, 303
 - radiography, phantom, 3019
- imagination**, cognition, hemisphere, nerve cell, nerve cell network, perception, visual cortex, visual nerve cell, model, 86
- imaging system**, bone scintigraphy, scintillation camera, cleon imager, case series, 2155

- fluorescence, roentgen radiation, imaging system evaluation, 2661
- immediate prosthesis**, above knee amputation, below knee amputation, weight bearing, load cell, 1118
- immobilization**, dentistry, restraining device, sling, dog, 2914
- immune deficiency**, cellular immunity, corona virus, mononuclear granulocyte, mouse hepatitis virus, spleen cell transplantation, thymectomy, T lymphocyte, virus infection, 3402
- immune response**, antibiotic agent, antibody production, antigen antibody reaction, delayed hypersensitivity, mathematic model, 3114
- immunization**, antibody affinity, antibody production, antigen antibody reaction, mathematical theories, epidemy, 2777
 - cost, epidemiology, mathematic model, model, statistics, 3509
 - cost, epidemiology, mathematic model, 3508
- immunoassay**, antigen antibody reaction, automation, turbidimetry, 756
- immunoglobulin g**, cancer chemotherapy, multiple myeloma, optimal control analysis, gompertzian model, mathematical model, 782
- immunosuppression**, acantholysis, chickenpox, herpes zoster, staining, vesiculo bullous disorders, paragon multiple stain, 500
- impact**, acceleration, computer program, head, intervertebral disk, neck, comprehensive, three dimensional head neck model, 2650
 - acceleration, back muscle, electromyography, dog, 715
 - acceleration, computer model, head, mathematic model, neck, motor vehicle crash victim, calspan 3 d computer simulator, 2426
 - acceleration, computer program, head, mathematic model, muscle, neck, math modelling, volunteers, 1266
 - acceleration, body posture, intervertebral disk, model, seat, musculoskeletal model, 3138
- impedance**, acupuncture, laplace analysis, 1746
 - conductance, general radio 1615, modification, 2137
 - defibrillation, electrode, electrode paste, model, interface material testing, 3698
 - electrode, electrode guarding, antigen, 2136
 - electrode, finger, plethysmography, electrode configuration, 1911
 - electroejaculation, intestine, prostate, bull, 2957
 - excitable membrane, hodgekin huxley equation, membrane impedance, 2839
 - microwave radiation, liquids, 2138
 - plant, low frequency impedance, 2550
- impedance plethysmography**, cardiography, heart output, method, 3691
 - heart output, plethysmography, thorax, thorax impedance, output computation, 2203
 - lung edema, plethysmography, thorax impedance, edema measurement method, 2216
- implant**, antenna, telemetry, 1771
 - bladder, bladder pacemaker, electrode, micturition, paraplegia, quadriplegia, spinal cord injury, urethra, baboon, 1486
 - bone stress, fixation, joint total replacement, poly(methacrylic acid methyl ester), strength of bonding, cyclic tensile loading, 865
 - brain depth stimulation, electrostimulation, platinum electrode, electrode area, 2086
 - coil, power supply, telemetry, coil design, 2108
 - electrostimulator, nervous system, 2626
 - femur, fracture, hip, joint total replacement, mathematic model, prosthesis, 3131
 - force transducer, muscle contraction, telemetry, uterine tube, monkey, 1770
 - integrated circuit, medical engineering, review, 526
 - microwave radiation, plexiglass, radiation hazard, 580
- implantation**, abdominal viscera, camera, estrus, solid state camera, sheep, 1782
 - amplifier, ph electrode, thick film hybrid technology, 2143
 - brain depth stimulation, electrostimulation, power supply, lateral hypothalamus, constant current, rat, 33
 - cochlea, deafness, electrode, hearing aid, prosthesis, multiple electrode system, 3341
 - hysteroscopy, occlusion, uterine tube, uterus, steerable hysteroscope, transcervical occlusion, 1067
 - potassium electrode, skull, spreading cortical depression, in vivo measurement, 3721
- inactivated virus vaccine**, epidemic, influenza a, influenza virus a, mathematic model, stochastic model, vaccination, 3499
- incision**, skin elasticity, surgery, excision, 1555
- incubation**, thermostat, differential control, 1800
- index**, automation, disease classification, medical record, pathology, snop vs icd, 2744
 - classification, coding, diagnosis, medical record, pathology, german, 341
- indicator dilution curve**, blood flow, mathematic model, pulsatile flow, 476
 - blood flow, mathematic model, vascular bed, 1715
 - blood flow, frequency function computation, 2942
 - blood vessel resistance, computer model, model study, dog, intravenous administration, 2455
 - blood volume, great vessels transposition, lung blood flow, model, new technique, 3703

- clearance, heart output, mathematic model, unified estimation theory, 73
- flow, human serum albumin i 131, iodine 125, tube, branching network, 1708
- flow, mathematic model, fluid flow rate, 1707
- direct ophthalmoscopy**, binocular ophthalmoscope, new device, method, 2254
- eye fundus, drawing teaching model, 686
- lens, condensing lens, 2634
- ophthalmoscopy, television, videorecording, 2253
- ophthalmoscopy, small pupil ophthalmoscope, 2997
- indocyanine green**, arteriovenous shunt, blood flow, heart muscle blood flow, heart output, microsphere ce 141, microsphere sr 85, turkey, dog, 1474
- indocyanin green**, SEE indocyanine green
- induction**, attenuator, voltage divider, low frequency divider, 954
- industrial hygiene**, aerosol, dust, particle counter, portable optical counter system, 3413
- air sampling, calibration manifold, 2266
- breathing apparatus, filter, gas mask, respirator absorbent filters, characterization, 649
- dosimetry, noise, audio dosimeter, 2912
- industrial medicine**, computer program, noise, sound level, cost computation, 2168
- directional hearing, hearing, sound detection, 265
- ear protection, noise pollution, performance, 3350
- electromagnetic radiation, microwave radiation, occupational health, radiation hazard, 3659
- hearing, 262
- industrial noise, noise pollution, sound level measurement, large machine in situ, 3262
- industrial noise, noise pollution, sound level measurement, in situ measurement, 3261
- industrial noise, noise pollution, sound level measurement, reflecting plane, 3260
- industrial noise, noise pollution, sound level measurement, 3259
- industrial noise, noise pollution, sound level measurement, indoors installed machine, 3258
- law, occupational safety, policy, united states, osha sanctions, effectiveness, decision theory, decision models, 3751
- industrial noise**, ear trauma, hearing, noise, noise pollution, chinchilla, threshold shift, 1283
- industrial medicine, noise pollution, sound level measurement, large machine in situ, 3262
- industrial medicine, noise pollution, sound level measurement, in situ measurement, 3261
- industrial medicine, noise pollution, sound level measurement, reflecting plane, 3260
- industrial medicine, noise pollution, sound level measurement, 3259
- industrial medicine, noise pollution, sound level measurement, indoors installed machine, 3258
- industry**, accident, fatigue, human factors research, safety, human error, pattern analysis, ortho oblique type binary data decomposition, 717
- accident, ergonomics, accident theory, study in 15 industries, finland, 2265
- bioengineering, ergonomics, occupational health, work environment, manual labor, uk, overview, 2653
- inert gas**, gas chromatography, helium, gas measurement, 3636
- lung ventilation perfusion ratio, mathematic model, recovery evaluation, 915
- infant**, newborn, tracheotomy, infant tracheal retractor, 3266
- infarction**, angina pectoris, heart muscle, image processing, radioisotope, thallium 201, 2287
- infection**, aerosol, asepsis, bacterial pollution, bronchial asthma, fungus, risk, 27 apparatuses, 18 subjects, mobile use, 1478
- monitoring, pressure transducer, infection control design, 150
- inferior cava vein**, cava vein blood flow, hemodynamics, vein blood flow, human, 924
- inferior cava vein filter**, lung embolism, nitinol filter, 2597
- inflammation**, bulla, exudate, histamine, kinin, prostaglandin, skin, recovery, method, 3363
- carrageen, paw edema, salicylic acid, edema measurement method, rat, 3679
- influenza a**, epidemic, inactivated virus vaccine, influenza virus a, mathematic model, stochastic model, vaccination, 3499
- influenza virus a**, epidemic, inactivated virus vaccine, influenza a, mathematic model, stochastic model, vaccination, 3499
- information processing**, acceleration, computer program, eye, statistics, vestibular nystagmus, velocity, analog processing, cross correlation data analysis, 1497
- acid base balance, blood gas, computer, 3412
- acoustic nerve, hearing, nerve potential, goldfish, 3346
- action potential, fourier transform, heart rate, point process, 71
- ad converter, automation, laboratory, microprocessor, multiplexer, modules marketing, 2519
- administration, computer, medical record, nuclear medicine, france, nancy, 2749
- adverse drug reaction, computer, monitoring, 3059
- air pollution, environment, lidar signal, 2578
- ambulatory care, computer, cost benefit analysis, medical record, combined with manual techniques, indianapolis, 1609

- analog computer, computer memory, 2119
- analog computer, digital computer, heart catheterization, hemodynamics, mini computer, 1990
- angiocardiology, angiography, computer, 3463
- antibiotic sensitivity, computer, drug sensitivity, 331
- artery, artery flow, doppler ultrasound flow meter, femoral artery, model, transfer function model, 3543
- automation, cholinesterase, enzyme inhibition, stop flow technique, inhibition constant, 1151
- automation, electroencephalography, sleep, eeg data processing chain, 778
- automation, computer, computer, electroencephalography, frequency analysis, 776
- automation, computer, electroencephalography, 773
- band pass filter, mathematic model, nerve potential, vision, visual stimulation, non linear spatial filter, 9
- behavior, computer, health care delivery, ambulatory patients, 3406
- bioassay, computer, radioimmunoassay, desk top computer, 755
- blood flow, digital computer, doppler ultrasound flow meter, ultrasonics, 2755
- brain, information science, nerve cell code, 489
- brain blood flow, compartment model, computer, xenon 133, one line, 852
- breast, diagnosis, thermography, 1940
- cancer, computer model, image processing, scintigraphy, normal brain, 2341
- cancer growth, computer program, mathematic model, statistics, gompertz function, fortran, 2782
- cardiology, data base, histopathology, pathology, respiration, ssis, 3087
- circadian rhythm, digital computer, fourier transform, progressive analysis, 2391
- clinical chemistry, computer, one line problems, 2691
- clinical laboratory, microcomputer, distributed processing, 2304
- clinical study, medical record, pharmacotherapy, 2750
- compartment model, curve fitting, numerical method, 2762
- computer, mass spectrometry, review, method evaluation, clinical chemistry, 334
- computer, digital logger, automatic tabular results, 3213
- computer, electrocardiography, electromyography, stationarity and normality test, 2326
- computer, medical record, radiotherapy, 1196
- computer, medical record, 841
- computer, general practice, health center, health visitor, medical record, nursing, public health service, social worker, real time management, great britain, 840
- computer, ophthalmology, programmed system, 1152
- computer, computer assisted diagnosis, echocardiography, heart catheterization, heart ventricle pressure, 1233
- computer, hospital, kulmbach hospital, 3414
- computer, digital computer, image processing, scintigraphy, 1576
- computer, information retrieval, applications in medicine, patient monitoring, 2877
- computer, epidemiology, mathematic model, 339
- computer, differential diagnosis, display system, hand, parkinsonism, tremor, 1240
- computer, newborn, respiratory distress syndrome, 3852
- computer, heart transplantation, pathophysiology, canada, phocar system, 3851
- computer, primary health care, micro computer, norway, 1146
- computer, ophthalmology, mini and micro computers, automatic perimetry, 1560
- computer, computer program, emergency ward, model, statistics, deterministic simulation model, data reconstruction, 2686
- computer interface, digital computer, history, voice response system, 1160
- computer memory, digital computer, digital recording, strip chart recorder, address indicator, 991
- computer model, least square method, exponentials, 1372
- computer program, probability, statistics, decomposition, algol, gaussian curve, 2404
- computer program, data base, medical record, pdp 12, 1610
- computer program, hospital service, medical record, capo program, canada, 1980
- computer program, hospital management, medical record, public health service, mumps, u.s.a., 2745
- computer program, medical record, microprocessor, mumps, 3044
- computer program, digital computer, lateral geniculate body, minicomputer, probability, spike, statistics, cat, 1617
- correlation function, nonlinear system, wiener analysis, 1737
- correlation function, electroencephalography, evoked response, 1948
- curve fitting, 3128
- data base, gastroenterology, medical record, 1611
- data base, documentation, hospital service, literature, public health service, network, heclinet system, gfr, 1228
- data base, medical documentation, medical record, gfr, 3467
- data base, medical documentation, model, postgraduate education, retrieval system, medlars, medline, index medicus, usa, problem oriented medical data, 2751

- data base, structuring method, 2878
- data base, medical record, sari, 372
- data reduction, statistics, 2022
- data reduction, data transmission, electrocardiography, microprocessor, telemetry, 1944
- decision, noise, signal detection, vision, multiple channel, human, 1694
- digital computer, gas exchange, spirometry, 2756
- digital computer, electrocardiography, rs t complex, 346
- digital computer, pattern recognition, speech, speech frequency, 63
- digital filtering, polyphase network, 987
- digital filtering, recursive filtering, 986
- digital filtering, fir filter, multirate filtering, 2528
- disabled, electromyography, prosthesis, signal processing, 1744
- electrocardiography, fetus electrocardiography, vectorcardiography, fetus, 2478
- electrocardiography, lead information content, 2884
- electrocardiography, filtering, sampling, 433 normals and patients, 2703
- electroencephalography, single epoch, 1747
- electroencephalography, evoked cortical response, evoked lateral geniculate response, mathematic model, cat, 89
- electroencephalography, electromyography, electrooculography, sleep, multidimensional analysis, 1082
- electromyography, integrated emg, analysis method, human, 3426
- electrophysiology, nonlinear system, 3124
- epilepsy, 335
- evoked visual response, latent period, 1950
- fetus heart rate, heart rate, labor, microprocessor, 1865
- filtering, image processing, charge coupled device, 3602
- fourier transform, heart rate, 1716
- fourier transform, lung, pneumography, 2053
- gait, locomotion, 2088
- glomerulopathy, histopathology, statistics, cluster analysis, 2959
- growth, longitudinal data, public health, quality control, mixed longitudinal study, multidisciplinary study, netherlands, 2780
- heart rhythm, volterra equation, 882
- information retrieval, medical record, management, 373
- ischemic heart disease, one line system, 1989
- luminance, mathematic model, night vision, photoreceptor, visual field, 3537
- mathematic model, synapse, 77
- mathematic model, nerve cell membrane potential, nerve cell network, nonlinear system, statistics, 2069
- mathematic model, 3497
- medical jargon, medical record, 3466
- microprocessor, moessbauer spectrometer, 3673
- microprocessor, signal processing, differential equation, 2879
- nerve cell, nerve cell network, stochastic model, 3561
- nerve cell code, smelling, 269
- psychology, task performance, man, 1495
- regression, statistics, least square method, 2400
- sampling, alias free, 3127
- signal detection, signal noise ratio, signal processing, detector array, 3126
- signal detection, signal processing, statistics, 3125
- tail regeneration, least square method, lizard, 1436
- voltage clamp, current voltage plotting, 1787
- information retrieval**, computer, information processing, applications in medicine, patient monitoring, 2877
- computer assisted tomography, 821
- information processing, medical record, management, 373
- information science**, algorithm, artificial intelligence, fuzzy algorithm, 2524
- auditory masking, hearing, 258
- brain, information processing, nerve cell code, 489
- communication, medical journal, medical research, misinterpretation by lay press, newsworthiness, 863
- computer program, review, 3231
- consonant, hearing, intelligibility, speech synthesizer, vowel, phoneme boundary effect, voice onset time, 57
- cybernetics, mathematic model, perception, 419
- decision, decision theory, review, 1260
- excitatory postsynaptic potential, granular cell, hippocampus, prediction of information theory, 2082
- granular cell, hippocampus, mathematic model, nerve cell, synapse, information theory, 2081
- identification, mathematic model, retina, system analysis, 2045

- laboratory, effectivity, 201
- information system**, blood group typing, computer, lyon, 3793
 - computer, nuclear medicine, radiography, automated system, 1971
 - computer, intensive care, medical record, newborn, data error rate, 2364
 - data base, mass utility multi programming system, 2682
- infrared radiation**, accommodation, optometry, microvariation recording, infrared optometer, 2246
 - air pollution, environment, light absorption, spectrometry, 2150
 - air pollution, carbon monoxide, hydrochloric acid, hydrofluoric acid, nitrogen oxide, sulfur dioxide, 233
 - blood flow, blood pressure, capillary flow, rheology, 3288
 - catheter, oximetry, oxygen, photometry, 1395
 - chlorophyll, cytochrome, electron transport, spectrometry, electron tunneling, 180
 - cryostate, bolometry, infrared detector, 2901
 - eye movement, optometry, eyetracking, 2637
 - fourier transform, spectrometry, chemistry, 3656
 - fourier transform, spectrometry, polymer analysis, 3655
 - image processing, hadamard transform, 534
 - image processing, spectrometry, image dissection, 579
 - laser, light modulator, spectrometry, telemetry, monochromate, carbon dioxide laser, 2900
 - light, vacuum, window, 3657
 - light, oximetry, 2588
 - light reflection, photometry, sulfur, reflection standard, 3490
 - luminescence, photography, cathodoluminescence, image sensor, 2871
 - thermal radiation, 3245
 - thermography, 3783
 - visual system, condenser, 3653
- infratentorial tumor**, brain tumor, computer assisted tomography, posterior cranial fossa tumor, 51 cases, 1187
- infusion**, computer, heart surgery, intensive care, monitoring, postoperative care, alabama, 2712
- infusion pump**, intravenous infusion, animals, 2535
- inhalation anesthesia**, anesthesia, anesthetic equipment, head, head enclosure, monkey, 1545
- inheritance**, computer, sex chromosome aberration, vectorcardiography, semiautomatic procedure, 770
 - gene frequency, migration, mutation, population model, statistics, stochastic model, island model, 2788
- inhibition**, nerve cell network, model, 1725
- inhibitory postsynaptic potential**, electroencephalography, epilepsy, excitatory postsynaptic potential, feedback system, filter, model, nerve cell network, neuron population, 3548
 - excitatory postsynaptic potential, mathematic model, nerve cell, stochastic model, automation model, 246
- injection**, angiography, power injector, 721
- injury**, aircraft accident, computer model, computer program, calspan gross motion simulation code, digital computer simulation, 2649
 - biological model, biomechanics, cadaver, thorax, 3137
 - biomechanics, biomechanical aspects, 2802
 - head trauma, mathematic model, model, skull fracture, response probability density function technique, 3365
 - model, thorax, 3307
- ink writing**, electrocardiography, recording, st segment, st distortion, direct writing recorders, 1051
- inosine**, adenosine, adenosine triphosphate, adenylyclase, computer model, coronary artery blood flow, cyclic amp, heart muscle ischemia, hypoxanthine, noradrenalin, rat, 872
 - adenylyclase, computer model, cyclic amp, heart muscle ischemia, hypoxanthine, noradrenalin, phosphodiesterase, vasodilatation, rat, 2452
- inotropism**, ectopic beat, heart infarction, heart muscle contraction, strain gauge transducer, miniature segment length strain gauge, 2924
- insomnia**, anxiety, biofeedback, electromyography, epilepsy, paralysis, spasticity, tension headache, clinical application, review, 1081
- inspiration**, air flow, analog computer, expiration, integrator, lung volume, respiration, drift suppression, 2377
 - exercise, expiration, mathematic model, respiration, 465
- instrumentation recorder**, tape recorder, pulse code modulation, 113
- instrument panel**, airplane pilot, body posture, hand, head, vibration, fighter bomber, lumped parameter biomechanical model, 3366
- insulator**, microelectrode, parylene, 1501
- insulin**, computer model, digital computer, glucose tolerance test, plasma, proinsulin, 18 patients, 2767
- insulin release**, blood glucose, glucagon, glucose tolerance test, mathematic model, model studies, 3113
- integrated circuit**, differential amplifier, medical instrumentation, 951
 - drinking device, licking, transducer, device, 1350
 - implant, medical engineering, review, 526

- logic circuit, low current characteristic, 2002
- monitoring, multichannel recorder, telemetry, 970
- ph electrode, 2144

integration, time, digital integration, 136

integrator, air flow, analog computer, expiration, inspiration, lung volume, respiration, drift suppression, 2377

- analog computer, grounded capacitor, 3603
- analog computer, 1790
- monitoring, steam sterilization, temperature, 199
- photoelectric cell, photometry, semiconductor, 175

intelligence, learning, model, 11

intelligibility, auditory masking, signal noise ratio, interrupted speech, 62

- auditory masking, hearing, noise, pure tone stimulus, 1505
- binaural hearing, hearing, speech, interfering speech, human, 55
- consonant, hearing, information science, speech synthesizer, vowel, phoneme boundary effect, voice onset time, 57
- consonant, speech, spanish, english, voice onset time, 2583
- deafness, hearing, masking, signal noise ratio, 657
- deafness, hearing aid, noise, signal noise ratio, speech discrimination, 34 patients, peak clipping, automatic pain control, 2628
- echo, hearing, signal processing, spectrometry, speech, 2819
- hearing, speech, child, 455
- hearing, signal noise ratio, speech, amplitude compression, 65
- hearing, speech, acoustic cues, 1512
- signal noise ratio, speech, speech enhancement, 3533
- speech, 2446

intensifying screen, segmental analysis, 3760

intensive care, anesthesia, brain, electroencephalography, monitoring, 2676

- artificial ventilation, mass spectrometry, 1060
- computer, heart arrhythmia, heart failure, heart infarction, pneumonia, 1031 cases, 3090
- computer, information system, medical record, newborn, data error rate, 2364
- computer, heart surgery, infusion, monitoring, postoperative care, alabama, 2712
- computer, heart output, monitoring, 2711
- computer, end tidal carbon dioxide tension, functional residual capacity, lung function test, mass spectrometry, monitoring, 2675
- coronary care unit, electric accident, emergency ward, hospital, labor room, operating room, recovery room, safety, maryland lutheran hospital, 502
- hospital, medical staff, 197
- mental hospital, teaching, closed circuit television, 3723

interference, alternating current, electrocardiography, interference suppression, monitoring, removal of ac current interference, 2133

- amplifier, electroencephalography, electromyography, telemetry, powerline interference, 1362
- artificial heart pacemaker, electromagnetic field, fluoroscopy, heart arrhythmia, external demand pacemaker, 1041
- electrocardiography, signal detection, signal noise ratio, high frequency ecg, 1749

interference filter, optic filter, alas filter, gaas filter, 172

interference suppression, ad converter, signal noise ratio, 3605

- alternating current, electrocardiography, interference, monitoring, removal of ac current interference, 2133
- electroencephalography, mains interference suppressor, 1071
- notch filter, t network, 3576

interferometry, blood clotting, ultrasonics, 2587

- dilatometry, displacement indicator, fiberoscope, laser, 1405
- displacement, laser, vibration, vibration measurement, displacement measurement, speckle interferometer, 1432
- laser, nerve fiber, nerve fiber potential, size changes, crayfish, 1498
- methane, design, 2553

interstitial fluid, capsule, endoneurium pressure, lead, nerve fiber, polyethylene, sciatic nerve, rat, 151

- cartilage, viscoelasticity, non linear interaction, cattle, 39
- plethysmography, pressure, dog, 550

intervertebral disk, acceleration, computer program, head, impact, neck, comprehensive, three dimensional head neck model, 2650

- acceleration, body posture, impact, model, seat, musculoskeletal model, 3138
- biomechanics, mathematic model, spine, workload, systems identification scheme, linear viscoelastic properties, 3140

interview, behavior, computer, medical record, problem oriented record, 2368

- behavior, computer, assessment, 3050
- computer, emotional disorder, personal relevance, 3418
- intestine**, alkaline phosphatase isoenzyme, bone, radiation injury, whole body radiation, biologic dosimetry, rat, 1162
 - electroejaculation, impedance, prostate, bull, 2957
 - electrostimulation, ileum, stimulation device, rat, mechanical stimulation, 2179
 - intestine motility, smooth muscle, transducer, implantation, dog, 3272
 - intestine motility, automation, high speed analysis, dog, myoelectric activity, 1169
 - leg, lung, lymph flow, lymph protein, lymph vessel, mathematic model, permeability, reflexion coefficient estimation, 1704
- intestine absorption**, intestine blood flow, mathematic model, 10 models, 3542
 - liquid scintillation, potassium, whole body counter, whole body potassium, description of counter, clinical application, 595
- intestine blood flow**, intestine absorption, mathematic model, 10 models, 3542
- intestine motility**, computer, electromyography, intestine sound, computer analysis, rabbit, 3472
 - intestine, smooth muscle, transducer, implantation, dog, 3272
 - intestine, automation, high speed analysis, dog, myoelectric activity, 1169
 - mathematic model, 3521
- intestine mucosa**, epithelium, intestine potential, intestine serosa, osmotic pressure, asymmetrical behavior, rat, 1441
- intestine potential**, epithelium, intestine mucosa, intestine serosa, osmotic pressure, asymmetrical behavior, rat, 1441
- intestine serosa**, epithelium, intestine mucosa, intestine potential, osmotic pressure, asymmetrical behavior, rat, 1441
- intestine sound**, computer, electromyography, intestine motility, computer analysis, rabbit, 3472
- intestine trauma**, burn, electric trauma, electrocoagulation, laparoscopy, uterine tube, uterine tube sterilization, 659
- intraarticular pressure**, biomechanics, forelimb, joint, ligament, tendon, race horse, 2805
- intracellular potential**, mast cell, microelectrode, peritoneum macrophage, measurement techniques, mouse, 155
- intracranial hypertension**, brain edema, cerebrospinal fluid, electroencephalography, head trauma, hematoma, tumor, cat, epidural pressure measurement, 1076
 - brain tumor, cerebrospinal fluid, electrocardiography, electroencephalography, hematoma, pneumoencephalography, telemetry, 20 cases, continuous recording, technique, 1487
 - cerebrospinal fluid, apparatus, measurement, durometer, 679
 - neurosurgery, continuous recording, 673
- intracranial pressure**, acceleration, head movement, vibration, model, monkey, 3009
 - brain, capacitance transducer, electromagnetic radiation, pressure transducer, telemetry, epidural implantation, 971
 - electromagnetic radiation, monitoring, telemetry, temperature, 1361
 - fiberoptic, head trauma, monitoring, pressure transducer, 46 cases, 2231
 - monitoring, pressure transducer, 1758
 - monitoring, pressure transducer, telemetry, rotterdam epidural teletransducer, 2493
 - monitoring, telemetry, device, 2492
 - monitoring, statistical analysis, automation, aspic system, 2233
- intrahepatic bile duct**, computer assisted tomography, liver, portal vein, simulation of dilated biliary ducts, 23 cases, 1206
- intraocular pressure**, aphakia, cornea transplantation, mathematic model, trabecular meshwork, 2800
 - applanation tonometry, glaucoma, tonometry, 2 new types, patients, normal subjects, 2247
 - applanation tonometry, for the dog eye, calibration, 2242
 - applanation tonometry, accuracy, comparative study, 141 eyes, 2995
 - aqueous humor, minicomputer, ophthalmology, xenon 133, pdp 8 e, cat, 3481
 - ophthalmic artery, tonography, new instrument, 3269
 - suction cup, continuous pressure measurement, rabbit, 2241
- intraorbital foreign body**, computer assisted tomography, orbit tumor, coronal tomography, 29 cases, 3436
- intravascular catheter**, catheter, exteriorization device, dog, 223
- intravenous infusion**, blood sampling, catheter, cold, temperature control, catheter content control, sheep, 2938
 - infusion pump, animals, 2535
- iodine**, americium, fluorescent scanning, gamma radiation, thyroid gland, concentric source detector design, 30
- iodine 123**, image processing, scintigraphy, scintillation camera, 729
- iodine 125**, flow, human serum albumin i 131, indicator dilution curve, tube, branching network, 1708
 - gamma counting, hospital laboratory, radioimmunoassay, 3250
 - gamma spectrometry, iodine 131, method, 3667
- iodine 129**, public health, radiation exposure, 942
- iodine 131**, gamma spectrometry, iodine 125, method, 3667

- radioactive waste, filter system, clinical experience, 497
- iodized contrast medium**, computer assisted tomography, k edge energy, 2734
- iodoacetate sodium**, carotid artery, clostridiopeptidase a, elasticity, hyaluronidase, model, noradrenalin, pancreatopeptidase e, sodium cyanide, maxwell model, voigt model, 1656
- iodohippurate sodium i 131**, computer, kidney blood flow, 853
- ion channel**, dipole theory, excitable membrane, gating circuit, 3178
 - lipid membrane, energy and potential profile, 3117
- ion exchange**, artificial kidney, cellophane, cellulose membrane, cuprophane, hemodialysis, hemodialysis membrane, 1875
 - calcium electrode, chloride electrode, magnesium electrode, microelectrode, potassium electrode, physicochemistry, 1343
 - cell membrane, cell membrane potential, ultraviolet radiation, spiropyran, photovoltaic cell, photochromism, 1007
 - cell membrane, mathematic model, sodium channel, 2848
- ionization chamber**, californium 252, dosimetry, roentgen dose distribution, liquid dielectric ionization chamber, 300
 - cobalt 60, dosimetry, phantom, gamma radiation, radiotherapy, 3013
 - computer assisted tomography, radiation detection, roentgen radiation, xenon, fan beam computed scanner, 3810
 - dosimetry, heavy particle radiation, thermoluminescence dosimeter, x ray film, radiation activation detector, radiobiological experiment, 1342
 - environmental monitoring, nuclear reactor, population exposure, thermoluminescence dosimeter, vermont yankee nuclear power station, 1335
 - fast neutron radiation, 598
 - fast neutron radiation, tissue equivalent dosimeter, response, 2899
 - model, radiography, roentgen radiation, energy dependence, 3665
 - radiation hazard, radiography, victoreen 570, 2658
 - radiation hazard, radiography, victoreen 666, 2657
- ionization meter**, dosimetry, fast neutron radiation, geiger mueller counter, gamma radiation, radiotherapy, fast neutron sensitivity, 1128
 - photometry, synchrotron, ultraviolet radiation, ionization chamber, 1009
- ionizing radiation**, dosimetry, radiation monitoring, radiation protection, automatic badge reading, 3390
 - linear accelerator, radiation protection, uranium, 2667
- iontophoresis**, artifact reduction, electrostimulator, electrooptic coupler, 1070
 - cell, drug, membrane capacitance, time course, 483
 - beta endorphin, gating circuit, naloxone, accurate current monitoring system, 3209
- ion transport**, cell membrane, mathematic model, membrane, osmotic pressure, thermodynamics, 2437
 - cell membrane, mathematic model, membrane, osmotic pressure, thermodynamics, 2436
 - cell membrane, cell membrane impedance, mathematic model, nerve cell, 2079
 - cell membrane, retina cone, ionic channel closure, turtle, 1521
 - cell membrane potential, mathematic model, thermodynamics, 1676
 - electron transport, membrane permeability, membrane potential, 392
 - membrane permeability, noise, theoretical study, 2390
 - membrane permeability, parameter calculation, 2772
- iridectomy**, aqueous humor outflow, glaucoma, laser, required energy, 2249
- iridium 191**, generator, iridium 191m, osmium 191, scintiangiocardiography, improved generator, ir 191m application in monkey, 1333
- iridium 191m**, generator, iridium 191, osmium 191, scintiangiocardiography, improved generator, ir 191m application in monkey, 1333
- iridium 192**, computer, dosimetry, gold 198, radioisotope therapy, 2723
 - dosimetry, decatron remote afterloading, 3752
 - radioisotope therapy, modified afterloading technique, 1123
- iron**, brain, brain cortex, copper, electromagnetic radiation, hypothalamus, magnesium, potassium, sodium, zinc, 1600 mhz, rat, 2564
- iron 57**, averaging, nuclear magnetic resonance, pulse generator, pulse echo, element analysis, 2858
- ischemic heart disease**, chronic disease, heart disease, mathematic model, 1703
 - computer, electrocardiography, exercise test, optimal measurement, 2698
 - cost, decision, diagnosis, differential diagnosis, mathematic model, mathematics, prognosis, statistics, expected outcome loss, 759
 - electrocardiography, high fidelity ecg vs ordinary for 'normal' patients, 1044
 - heart muscle ischemia, mathematic model, ischemic tension development, regionally ischemic heart muscle, 2058
 - information processing, one line system, 1989
- isoenzyme**, adenylosuccinate synthetase, liver, rat, 2128

- blood stain, clothing, forensic medicine, lactate dehydrogenase, soil, weapon, species origin, 3276
- isolated heart**, clamp, heart ventricle enddiastolic volume, heart ventricle endsystolic volume, heart ventricle pressure, heart ventricle volume, pump, servocircuit, volume clasper, dog, 3290
- computer, heart muscle conduction system, heart muscle potential, analysis, dog, 1234
- computer assisted tomography, heart, heart arrest, heart function, dog, 1604
- computer model, heart left ventricle, heart muscle, 3 dimensional finite element analysis, 1987
- isolation unit**, cesarean section, 3315
- isometric muscle contraction**, electromyography, signal noise ratio, filtered emg, 1001
- isoprenaline**, blood pressure, heart rate, dog, direct measurement, 2601
- isotope tracing**, capillary flow, heart muscle blood flow, model, physiology, theory of tracer washout technique, 2929
- jaw**, computer, electromyography, mastication, muscle contraction, man, 1613
 - computer program, photography, skeleton, medial axes, algol, 1973
 - lip, movement, television, 1031
- jaw surgery**, articulator, prototype articulator, 3036
- joint**, angle transducer, linearity, 1757
 - ankle, anterior tibial muscle, electromyography, foot, gastrocnemius muscle, rotation, soleus muscle, sinusoidal torque, human, 895
 - anthropometry, knee, scaling method, 1524
 - biomechanics, lubrication, elastohydrodynamic lubrication, 2807
 - biomechanics, forelimb, intraarticular pressure, ligament, tendon, race horse, 2805
 - cartilage, cartilage cell, impact characteristics, 1527
 - coordination, electromyography, locomotion, mathematic model, movement, human, 432
 - electroencephalography, mathematic model, movement, walking, automatic calculation method, human, 445
 - femur, tibia, position control, schistocerca, 3149
 - movement, speech, vocal system, 1867
- joint capsule**, bone cement, endoprosthesis, joint total replacement, macrophage, methacrylic acid methyl ester, wear product reaction, 1110
- joint mobility**, ankle, fracture external fixation, osteosynthesis, physiotherapy, rehabilitation, talipes equinus, tibia fracture, foot movement plate, 3742
 - biomechanics, elbow, pronation, supination, 100 volunteers, 1658
- joint total replacement**, arthroplasty, knee, subluxation, 1 yr follow up, 47 out of 53 cases, wide track polycentric knee prosthesis, 2645
 - bone cement, endoprosthesis, joint capsule, macrophage, methacrylic acid methyl ester, wear product reaction, 1110
 - bone stress, fixation, implant, poly(methacrylic acid methyl ester), strength of bonding, cyclic tensile loading, 865
 - femur, fracture, hip, implant, mathematic model, prosthesis, 3131
- jugular vein**, brain blood flow, vein occlusion plethysmography, non invasive measurement, newborn infant, 1861
 - elasticity, femoral vein, shear stress, dog, 2793
- jumping**, long jump, angular momentum, 1674
- juvenile hemangiofibroma**, computer assisted tomography, rhinopharynx tumor, 3 cases, 3458
- karyotype**, chromosome analysis, computer, lymphocyte, metaphase, microscopy, automatic metaphase finding, 1563
- karyotyping**, chromosome analysis, computer analysis, pattern recognition, computer assisted analysis, 2302
- keratoconjunctivitis sicca**, computer assisted diagnosis, rheumatoid arthritis, 3420
- keratometer**, astigmatism, cataract extraction, cornea curvature, cornea transplantation, microsurgery, troutman type, 1517
- keratopathy**, soft contact lens, bauch and lomb 't' lens, 132 patients, 263
- keratoscopy**, contact lens, cornea curvature, new device, 3344
- kidney**, acoustic impedance, erythrocyte, liver, muscle, sound velocity, tissue, ultrasonics, viscosity, shear acoustic impedance, 58
 - computer assisted tomography, echography, pancreas, spleen, differential diagnosis, case report, 3817
 - liver, mathematic model, substrate, time dependence, 3165
 - liver, radiation hazard, testis, ultrasonics, rabbit, 1828
 - mathematic model, transient behavior analysis, 3171
- kidney abscess**, computer assisted tomography, kidney carcinoma, kidney cyst, 180 cases, 3080
- kidney anomaly**, adrenal cancer, computer assisted tomography, kidney cancer, survey, 3071
- kidney arteriography**, computer assisted tomography, hydronephrosis, kidney cancer, kidney cyst, 70 cases, 822

kidney blood flow, computer, iodohippurate sodium i 131, 853

kidney cancer, abdominal radiography, computer assisted tomography, contrast medium, case report, man of 79, 823

- adrenal cancer, computer assisted tomography, kidney anomaly, survey, 3071
- computer, dimercaptosuccinate technetium tc 99m, kidney cyst, kidney scintiscanning, a comparing study, 2718
- computer assisted tomography, hydronephrosis, kidney arteriography, kidney cyst, 70 cases, 824

kidney carcinoma, computer assisted tomography, kidney abscess, kidney cyst, 180 cases, 3080

kidney concentrating capacity, arteriole resistance, kidney medulla, model, nephron, rabbit, central core model, 916

kidney cyst, computer, dimercaptosuccinate technetium tc 99m, kidney cancer, kidney scintiscanning, a comparing study, 2718

- computer assisted tomography, hydronephrosis, kidney arteriography, kidney cancer, 70 cases, 824
- computer assisted tomography, kidney abscess, kidney carcinoma, 180 cases, 3080

kidney disease, computer assisted tomography, endoscopic retrograde cholangiopancreatography, liver disease, liver scintiscanning, pancreas disease, retroperitoneal disease, tomography, 359

kidney failure, blood pressure, blood vessel resistance, mathematic model, renovascular hypertension, sodium, water, 2420

- cancer, computer program, drug half life, folinate calcium, mathematic model, methotrexate, pharmacokinetics, 5 patients, 3435
- cerebrospinal fluid pressure, hemodialysis, mathematic model, urea, treatment guideline, 477
- discriminatory analysis, electroencephalography, 3333

kidney function, aldosterone, angiotensin, blood volume, computer model, vasopressin, 1311

- computer, countercurrent multiplier system, mathematic model, 2457

kidney medulla, arteriole resistance, kidney concentrating capacity, model, nephron, rabbit, central core model, 916

- diuresis, henle loop, hyponemia, kidney tubule, mathematic model, urea, human kidney, 2460
- kidney tubule absorption, mathematic model, single loop solute cycling model, 3545

kidney plasma flow, SEE renal plasma flow

kidney scintiscanning, computer, dimercaptosuccinate technetium tc 99m, kidney cancer, kidney cyst, a comparing study, 2718

kidney slice, cell membrane potential, glass electrode, microelectrode, sweat gland, self filling, semifloating, rat, 1805

kidney transplantation, computer, nephrectomy, misleading data base, 854

kidney tubule, cell membrane permeability, epithelial cell, hydrostatic pressure, osmotic pressure, 387

- diuresis, henle loop, hyponemia, kidney medulla, mathematic model, urea, human kidney, 2460

kidney tubule absorption, computer model, digital computer, diuresis, sodium, sodium depletion, water, 478

- computer model, countercurrent multiplier system, mathematic model, sodium, urea, transient simulation, steady state simulation, 473
- kidney medulla, mathematic model, single loop solute cycling model, 3545
- mathematic model, puncture, variance model, 2057

kindling, amygdaloid nucleus, electroencephalography, mathematic model, first approximation model, 2475

kinesiotherapy, balneology, duodenum ulcer, exercise, heart rate, telemetry, czechoslovakia, 522

- hand function, pneumatic cushion foil, 706

kinotocardiography, cardiography, echography, ultrasonic transducer, 2284

- heart sound, vibration, electrooptical scanner, 1047
- recording, capillary damped pick up, calibration unit, 2187
- thorax movement, magnetic noncontact apexcardiography, 10 normal subjects, 1444

kinin, bulla, exudate, histamine, inflammation, prostaglandin, skin, recovery, method, 3363

knee, anthropometry, joint, scaling method, 1524

- arthroplasty, joint total replacement, subluxation, 1 yr follow up, 47 out of 53 cases, wide track polycentric knee prosthesis, 2645
- arthrosis, varus knee, movement, varus stress, 3517
- arthrosis, muscle force, maximum stress evolution, 1269
- biomechanics, knee prosthesis, simulator, knee joint simulator, 3004
- biomechanics, femur osteotomy, tibia osteotomy, stress correction, 2798
- biomechanics, knee prosthesis, human knee joint, 47
- elasticity, patellofemoral joint, viscosity, contact study, 1114
- goniometry, total motion goniometry, 888
- knee instability, rheumatoid arthritis, mediolateral stability knee analyser, 2795
- orthosis, polypropylene, hinged orthosis, 2999
- radiography, landmarks on lateral radiograph during rotation, 298
- stiffness, non linear coupled stiffness, measurement, human, 40

knee amputation, leg prosthesis, pneumatic prosthesis, socket, pneumatic suspension, 2642

- knee instability**, knee, rheumatoid arthritis, mediolateral stability knee analyser, 2795
- knee prosthesis**, biomechanics, knee, simulator, knee joint simulator, 3004
 - biomechanics, knee, human knee joint, 47
- korotkow sound**, aorta balloon, aorta valve prosthesis, assisted circulation, cardiovascular system, simulator, design, performance, 2177
- krypton**, brain blood flow, brain scintigraphy, computer assisted tomography, edetic acid, gallium 68, positron emission tomography, positron scintiscanning, 120 cases, 799
 - bronchography, computer assisted tomography, contrast medium, lung ventilation, xenon, phantom study 790
 - freon, xenon, freon 13 b1, gas mixture, 68
- krypton 81m**, computer, lung ventilation, mathematic model, scintillation camera, clinical examples, lung ventilation measurement, 1475
- krypton 85**, muscle, multiexponential washout, dog, 1420
 - process control, radioisotope, flow rate, leak testing, 2250
- kymography**, display system, oscilloscope, photography, frame identification, 2487
 - heart infarction, heart movement, heart wall, non invasive analysis, dog, 3289
- labor**, computer, delivery, fetus, fetus heart rate, pregnancy, 1571
 - delivery, pregnancy, continuous posub 2 monitoring, transcutaneously, electrode, 564
 - delivery, partogram, electronic apparatus, 3314
 - delivery, partogram, 3313
 - fetus heart rate, heart rate, information processing, microprocessor, 1865
 - uterus contraction, impedance measurement, 30 cases, patient comfort, 2614
- laboratory**, ad converter, automation, information processing, microprocessor, multiplexer, modules marketing 2519
 - information science, effectivity, 201
- laboratory automation**, algorithm, computer program, microprocessor, process control, 2692
- laboratory diagnosis**, computer, liver disease, liver function, monitoring follow-up, human, 3798
- laboratory test**, clinical chemistry, computer, medical audit, continuing education, control of overutilization, 3794
- labor room**, coronary care unit, electric accident, emergency ward, hospital, intensive care, operating room, recovery room, safety, maryland lutheran hospital, 502
- lacrimal duct**, eye surgery, fiberoscope, lacrimal sac, device, 'pig tail' probe, 1094
 - trephine, new device, surgical technique, 3398
- lacrimal sac**, eye surgery, fiberoscope, lacrimal duct, device, 'pig tail' probe, 1094
- lactate dehydrogenase**, blood stain, clothing, forensic medicine, isoenzyme, soil, weapon, species origin, 3276
- lactate permease**, adenosine triphosphatase, computer model, glycogenolysis, glycolysis, heart perfusion, hypoxia, rat, 2170
- lake**, SEE lake water
- lake water**, mathematic model, polychlorinated biphenyl, sediment, lake michigan, material balance study, 124
- laminar air flow**, contamination, mouse, staphylococcus aureus, staphylococcus epidermidis, streptococcus, defined flora, husbandry, 3205
 - gas, gas diffusion, gas mixing, flowing gas, 1296
 - manganese 56, flow measurement, 1379
 - model, radioisotope, flow measurement methods, 1377
 - radioisotope, tracer sphere flow measurement method, 1378
- lamp**, hydrogen discharge, monochromator, vacuum, 1817
- language**, computer model, learning, different language, 3112
- laparoscopy**, burn, electric trauma, electrocoagulation, intestine trauma, uterine tube, uterine tube sterilization 659
 - forceps, manipulator, sterilization, uterus, bipolar principle, 660
 - sterilization, instrumentation, bipolar electrode, 661
- laplace law**, fourier transform, lateral eye, lateral inhibition, neural set, limulus, 2248
 - fourier transform, 1653
- laryngectomy**, larynx prosthesis, 2586
- laryngoscopy**, fiberoscope, small laboratory animals, hamster, rat, 2951
 - focussing magnifying laryngoscope, 2948
- larynx**, correlation function, electromyography, speech, volunteer, 3217
- larynx prosthesis**, forensic science, frequency analysis, sex identification, speech spectrography, vocal system 12 volunteers, experimental study, 3107
 - laryngectomy, 2586
- laser**, acupuncture, rheumatic disease, akuplas device, 2898
 - aerosol, air pollution, atmosphere, lidar, 403

- air pollution, atmosphere, vision, 1252
- air pollution, environment, monitoring, digital system, 1480
- anemometry, droplet size, 3612
- anemometry, doppler ultrasound flow meter, 154
- aqueous humor outflow, glaucoma, iridectomy, required energy, 2249
- argon laser, gastrointestinal hemorrhage, gastroscopy, stomach ulcer, dogs, device, treatment, 3274
- blood cell count, erythrocyte, leukocyte, thrombocyte, laser beam optics, hemac 6301, 570
- blood flow, capillary flow, doppler ultrasound flow meter, laser doppler measurement, 3694
- calorimetry, carbon dioxide laser, power measurement, co₂ laser, 174
- cell diameter, erythrocyte, light diffraction, microscopy, 2182
- chlorophyll, methylpheophorbide a, photosynthesis, pheophetin a, 167
- correlation function, echography, light reflection, ultrasonics, 127
- cytology, deoxyribonucleic acid, spectrometry, uterine cervix cytology, 2510
- depth perception, pupil, vision, 3539
- dilatometry, displacement indicator, fiberoscope, interferometry, 1405
- displacement, interferometry, vibration, vibration measurement, displacement measurement, speckle interferometer, 1432
- eye, retina lesion, vision, ocular hazard, monkey, 3637
- flow, photography, speckle photography, 2496
- frequency modulation, molecular structure, spectrometry, derivative spectroscopy, 2146
- image processing, microscopy, scanning microscopy, 2505
- infrared radiation, light modulator, spectrometry, telemetry, monochromate, carbon dioxide laser, 2900
- interferometry, nerve fiber, nerve fiber potential, size changes, crayfish, 1498
- lens, coating, 1815
- light modulator, tooth drill, 178
- microelectrode, nerve cell potential, multi microelectrode array, microelectrode processing, 2547
- microphone, ultrasonics, non linear acoustics, 601
- microscope illumination, 514 nm wave length, 568
- monochromator, ultraviolet radiation, 2145
- photodiode, photometry, 3643
- photometry, photoresistor, semiconductor, stannic oxide, 3645
- photon, 2 photon effect, 66
- positioning, radiation dose fractionation, radiotherapy, laser cross hair sidelight, 3387
- positioning, radiotherapy, 3766
- refraction, 30 cases, meridional method, 168
- spectrometry, submillimeter table, 574
- tensile strength, wound healing, rat, 2031
- dye laser, principle, 1408

laser cane, blindness, mobility, visual aid, electronic aids, sonic guide, children, pathsounder, 1508

latent period, computer, evoked cortical response, digital display, 1618

- evoked cortical response, reaction time, p 300, stimulus evaluation time, chronometry, 1882
- evoked visual response, information processing, 1950
- motor nerve, nerve conduction, signal processing, transfer, 1751

lateral eye, fourier transform, laplace law, lateral inhibition, neural set, limulus, 2248

- mathematic model, nerve cell potential, limulus, 1696

lateral geniculate body, computer program, digital computer, information processing, minicomputer, probability, spike, statistics, cat, 1617

- digital computer, nerve cell network, vision, visual system, cat, 2380
- mathematic model, nerve cell network, cat, 3186
- mathematic model, nerve cell potential, visual field, space time weight function, 3185
- mathematic model, nerve cell potential, red nucleus, reticular formation, spike, markov model, ventrobasal complex, 1313

lateral hypothalamus, brain depth stimulation, medial forebrain bundle, nerve cell potential, strength duration curve, rat, 3182

law, accident, cost, rescue personnel, equipment, organization, minden grf, 2575

- illusion, perception, vision, mathematic model, stability, 3161
- industrial medicine, occupational safety, policy, united states, osha sanctions, effectiveness, decision theory, decision models, 3751

lead, capsule, endoneurium pressure, interstitial fluid, nerve fiber, polyethylene, sciatic nerve, rat, 151

lead encephalopathy, brain pseudotumor, computer assisted tomography, lead poisoning, case report, 816

lead poisoning, brain pseudotumor, computer assisted tomography, lead encephalopathy, case report, 816

learning, computer, decision, medical education, u.k., 1557

- computer model, language, different language, 3112
- higher nervous system activity, mathematic model, neural theory, 930

- intelligence, model, 11
- mathematic model, memory, nerve cell network, pattern recognition, potassium channel, sodium channel synapse, 1316
- lecithin**, beta carotene, cellulose derivative, membrane potential, photostimulation, retinal isomer, 3156
 - elasticity, flow, mathematic model, shear rate, suspension, viscosity, 1710
 - lipid membrane, membrane steady potential, monazomycin, nonactin, phosphatidylethanolamine, phospholipid, valinomycin, antibiotic membrane probe, 1247
- lecithin membrane**, bilayer membrane, forces measurement, forces modification, 871
- left coronary artery**, angiocardiology, modification of philips cradle, 735
 - angiocardiology, longitudinal angulation, 100 examinations, 2268
- leg**, arthritis, atherosclerosis, computer, data base, 839
 - atherosclerosis, plethysmography, high gain capacitive plethysmograph, 1056
 - intestine, lung, lymph flow, lymph protein, lymph vessel, mathematic model, permeability, reflexion coefficient estimation, 1704
 - orthosis, splint, weight bearing, 1320 mechanics, 3001
 - orthosis, splint, total hip prosthesis, case report, 3000
- leg brace**, gait, oxygen consumption, rehabilitation, spinal cord injury, spinal cord transverse lesion, walking, 3 cases, pneumatic orthosis, 289
- leg lengthening**, femur, tibia, extension nail, 2643
 - 10 cases, tension, lengthening, 2421
- leg movement**, accelerometer, telemetry, 1893
 - computer model, coordination, walking, insect, 1278
- leg prosthesis**, above knee prosthesis, electromyography, myoelectric control, leg controller, 2263
 - knee amputation, pneumatic prosthesis, socket, pneumatic suspension, 2642
- lennox gastaut syndrome**, age, cerebellum atrophy, computer assisted tomography, 38 cases, etiology, 2735
- lens**, camera, modulation transfer function, zoom lens, 3590
 - electron microscopy, magnetic lens, rotation free lens, 3600
 - indirect ophthalmoscopy, condensing lens, 2634
 - laser, coating, 1815
 - physiologic optics, fish lens in a spider, 67
 - stroboscopy, television, vocal cord, amplitude determination, 3309
 - water, measurement, instrumentation, 169
- lens luxation**, computer assisted tomography, exophthalmos, eye foreign body, orbit tumor, retinoblastoma, 33 cases, 2742
- lens potential**, ouabain, potassium, temperature, oil chamber, bovine lens, asymmetry potential, 2243
- leukemia cell**, cell culture, cyclotron, fast neutron radiation, fibroblast, hemopoietic cell, gamma radiation, relative biologic effectiveness, radiologic calibration program, hamster, human fibroblast, mouse, guinea pig, 2094
- leukocyte**, artificial kidney, dialysis membrane, erythrocyte, thrombocyte, blood component deposited, electron microscopy, 621
 - automation, blood, corning larc leukocyte analyzer, 1561
 - blood cell count, erythrocyte, laser, thrombocyte, laser beam optics, hemac 6301, 570
 - counter, pattern recognition, television, hematrak differential counter, 628
- leukocyte count**, automation, circadian rhythm, hematocrit, hemoglobin, thrombocyte count, differential count, hemalog d, 3685
- leukoencephalopathy**, brain atrophy, brain tumor, computer assisted tomography, progressive multifocal leukoencephalopathy, 3 cases, neuropathology, 2 autopsies, ultrastructure, diagnosis, 365
 - computer assisted tomography, methotrexate, myeloid leukemia, necrotic leukoencephalopathy, computed tomography, woman of 39, female 39 yrs, clinical course, 371
- levodopa**, alertness, computer, electroencephalography, electromyography, 5 hydroxytryptophan, rem sleep, sleep spindle, stage 3 sleep, automatic classification, cat, 1620
 - movement, task performance, tremor, tracking task, portable instrument, 1880
- library**, computer, health care delivery, medical documentation, patient care, public health service, patient care, literature coordination, 2695
- licking**, drinking device, integrated circuit, transducer, device, 1350
- life**, chemical kinetics, computer model, evolution, mathematic model, prokaryotic cell, 2774
 - crystal, memory, definition, crystalline physiology, 2969
 - evolution, magnetic field, 3110
- lifespan**, s (2 aminoethyl) isothiuronium, mortality, radiation dose fractionation, whole body radiation, mouse, 2903
 - population model, statistics, lifetime distribution, 2407
- life support system**, ambulance, emergency, heart infarction, telemetry, 3292
- life table**, computer, contraception, 3040

- computer program, follow up, population model, risk factor, survival rate, 1637
- lifting effort**, nursing, sliding cushion, 1107
- ligament**, biomechanics, forelimb, intraarticular pressure, joint, tendon, race horse, 2805
 - electromyography, hip, mathematic model, forces evaluation, 437
- ligand**, computer program, drug protein binding, serum albumin, thyroxine, 1153
- light**, contrast, darkness, mathematic model, retina image, visual system, human system, 1697
 - diode, display system, voltmeter, led array, 956
 - electroretinography, light intensity, photostimulation, an instrument for standardization, 2252
 - electroretinography, retina, temperature, combined sensor, 1519
 - eye temperature, mathematic model, retina, transient thermal response, 2039
 - infrared radiation, vacuum, window, 3657
 - infrared radiation, oximetry, 2588
 - light modulator, ultraviolet radiation, 3652
 - optical lens, visual distortion, displaying distortion, 3639
 - radiation, narrow band lamp, high intensity radiation, 1006
 - retinula cell, ultraviolet radiation, fly, retinula, 1514
 - spectrometry, ultraviolet radiation, fourier transform, 3644
 - ultraviolet radiation, 2562
- light absorption**, air pollution, environment, infrared radiation, spectrometry, 2150
 - camphorquinone, holography, image processing, organic medium, 128
 - mathematic model, photolysis, 2557
- light adaptation**, dark adaptation, photoreceptor, ventral photoreceptor, limulus, 3735
- light diffraction**, cell diameter, erythrocyte, laser, microscopy, 2182
 - computer, muscle contraction, muscle fiber, muscle tetanic contraction, sarcomere, frog, in vitro, 2373
 - diffractometer, muscle, muscle contraction, muscle length, photodiode, sarcomere, sarcomere length determination, 3362
 - digital computer, muscle fiber, refraction index, sarcomere, ccd, 177
- light intensity**, electroretinography, light, photostimulation, an instrument for standardization, 2252
- light modulator**, electric field, electrochromism, 576
 - fluorescence, 4 ps. life time, 2501
 - fluorometry, phase fluorometer, 571
 - frequency modulation, phase modulator, 3646
 - infrared radiation, laser, spectrometry, telemetry, monochromate, carbon dioxide laser, 2900
 - laser, tooth drill, 178
 - light, ultraviolet radiation, 3652
 - spectrometry, high speed chopper wheel, air turbine, 179
 - switch, waveguide, 3243
 - telemetry, 288 mhz, 2896
 - 3489
- light reactivity**, erythema, erythropoietic porphyria, minimum erythema dose, photochemotherapy, phototest, ultraviolet radiation, new apparatus, application, 3651
- light reflection**, cell membrane potential, heart muscle, pulse generator, stimulator, capacitor discharge, frog, 78
 - correlation function, echography, laser, ultrasonics, 127
 - infrared radiation, photometry, sulfur, reflection standard, 3490
- light scattering**, counter, spermatozoon, spermatozoon motility, 1368
- limb lengthening**, arthrodesis, congenital hip dislocation, fracture external fixation, pseudarthrosis, 48 patients, ilizarov apparatus, 3743
- limb prosthesis**, finger tip, powered prosthesis, design, grip, 1108
- linear accelerator**, betatron, dosimetry, neutron radiation, radiation exposure, 2852
 - central nervous system, cobalt therapy, radiation field, orthogonal field, dose distribution, 3025
 - collimator, display system, fast electron therapy, megavoltage radiotherapy, collimator positioning device, 2659
 - computer, radiotherapy, therapy, 2334
 - computer, therapy, tissue maximum ratio, 2359
 - computer, dosimetry, megavoltage radiotherapy, 3081
 - dosimetry, megavoltage radiotherapy, 3666
 - dosimetry, megavoltage radiotherapy, radiation detection, silicon diode, 2664
 - ionizing radiation, radiation protection, uranium, 2667
 - neutron spectrometry, neutron therapy, least square technique, neutron spectra from bonner sphere data, 2854
- linear active network**, rc network, 1
- linear energy transfer**, dosimetry, fast proton radiation, ferrous sulfate dosimeter, radiotherapy, 1130
 - neutron radiation, phantom, pion radiation, radiotherapy, roentgen dose distribution, 1198

- linear system**, chemical kinetics, mathematic model, 1640
 - computer model, transient response, differential equation, 138
- linear tomography**, circular tomography, tomography, comparison of diagnostic value, 2277
 - dose, tomography, automatic dose rate control, 2728
- lip**, algorithm, electromyography, speech, analysis, synthesis, manipulation, feature, 1985
 - jaw, movement, television, 1031
 - speech, mouth movement, lip opening, 1682
- lipid**, hexadecane, membrane capacitance, protein, bilayer mambrane, membrane physical chemistry, 3629
 - lipid membrane, phytanic acid, capacity, membrane capacity capacity, 3547
- lipid membrane**, alamethicin, membrane potential, voltage clamp, multipore system, multi pore system, voltage jump current relaxation measurement, 3174
 - alamethicin, autocorrelation, membrane permeability, membrane potential, power, multi pore system, autocorrelation analysis, power spectral density, 3549
 - ammonium derivative, electric resistance, tetrapentyl ammonium cation model, theoretical aspects, bilayer membrane, in vitro, 560
 - calcium adenosine triphosphatase, cell membrane, membrane protein, rhodopsin, 404
 - contact, membrane potential, contact force, 3555
 - dielectric constant, membrane, theoretical calculation, bilayer membrane, 91
 - ethylene glycol, membrane potential, bilayer membrane, 3177
 - excitable membrane, membrane potential, nerve fiber membrane, 394
 - excitable membrane, membrane permeability, nerve fiber membrane, potassium, sodium, didactic presentation, 393
 - gating circuit, membrane potential, bilayer membrane, 869
 - ion channel, energy and potential profile, 3117
 - lecithin, membrane steady potential, monazomycin, nonactin, phosphatidylethanolamine, phospholipid, valinomycin, antibiotic membrane probe, 1247
 - lipid, phytanic acid, capacity, membrane capacity capacity, 3547
 - membrane capacitance, electrocompression, squid, 2471
 - membrane permeability, mitochondria membrane, ultraviolet radiation, 1625
 - membrane potential, nerve fiber membrane, non linear electric affects, 1736
 - membrane potential, tetraphenylborate sodium, electrostatic interaction, 2472
 - membrane potential, tetraphenylborate sodium, voltage clamp, bilayer membrane, 3173
 - polymer, bilayer membrane, stabilization, 3493
 - thermal stimulation, bilayer membrane, 1251
 - van der waals force, bilayer membrane, 1276
- lipoprotein**, ultracentrifugation, air driven micro ultracentrifuge, routine determination, 503
- liposome**, brain, liver, phosphatidylinositol, phospholipid exchange protein, beef, 397
- liquid chromatography**, chromatography, new detectors, 1796
 - environmental monitoring, water pollution, water quality, 1028
- liquid crystal**, fourier transform, spectrometry, temperature dependence, 1816
 - microwave radiation, radiation detection, radiation hazard, 2151
- liquid scintillation**, intestine absorption, potassium, whole body counter, whole body potassium, description counter, clinical application, 595
- literature**, computer, documentation, lisp, personal documentation, 1982
 - data base, medlars, retrieval system, request analysis, medline, 1607
 - data base, documentation, hospital service, information processing, public health service, network, heclir system, gfr, 1228
 - digital computer, medical record, retrieval system, review, 836
 - digital computer, documentation, university London, 3849
- lithium**, artificial heart pacemaker, battery, selection, different batteries, power source, 1466
 - beryllium, dosimetry, fast neutron radiation, fast proton radiation, 2572
 - deuteron radiation, fast neutron radiation, fast particle radiation, fast proton radiation, neutron radiation, 3254
- lithium chloride**, adenosine triphosphatase, amnesia, cycloheximide, memory, ouabain, phenytoin, potassium chloride, protein synthesis, sodium pump, 3 phase model, 241
- lithium fluoride dosimeter**, calcium fluoride dosimeter, neutron radiation, radiotherapy, thermoluminescence dosimeter, 1920
 - cobalt 60, dosimetry, fast electron radiation, gamma radiation, radiotherapy, thermoluminescence, 1129
- lithotripsy**, cholelithiasis, common bile duct, endoscopy, gallstone, 1036
- liver**, acoustic impedance, erythrocyte, kidney, muscle, sound velocity, tissue, ultrasonics, viscosity, shear acoustic impedance, 58
 - adenylosuccinate synthetase, isoenzyme, rat, 2128
 - brain, liposome, phosphatidylinositol, phospholipid exchange protein, beef, 397
 - computer assisted tomography, hemochromatosis, hemosiderosis, excessive iron storage, 14 patients, 12

- healthy controls, 803
- computer assisted tomography, intrahepatic bile duct, portal vein, simulation of dilated biliary ducts, 23 cases, 1206
- computer assisted tomography, pancreas, thorax, 354
- computer assisted tomography, survey, 3068
- computer assisted tomography, densitometry, whole body tomography, 120 cases, 1564
- kidney, mathematic model, substrate, time dependence, 3165
- kidney, radiation hazard, testis, ultrasonics, rabbit, 1828
- liver cirrhosis, rheology, cattle, pig, 1837
- neutron activation analysis, trace element, determination of bulk and trace elements, bovine liver, 2894
- liver blood flow**, bioavailability, blood cell aggregation, drug clearance, drug metabolism, drug protein binding, enzyme, mathematic model, pharmacokinetics, review, 3108
- capillary pressure, liver capillary, liver vascular resistance, mathematic model, dog, 2062
- liver cancer**, computer assisted tomography, hepatography, liver cyst, pancreas disease, 120 cases, whole body tomography, 831
- liver capillary**, capillary pressure, liver blood flow, liver vascular resistance, mathematic model, dog, 2062
- liver cell**, ph, effect in isolation, rat, 616
- liver cirrhosis**, liver, rheology, cattle, pig, 1837
- liver cyst**, computer assisted tomography, hepatography, liver cancer, pancreas disease, 120 cases, whole body tomography, 831
- computer assisted tomography, echinococcosis, case report, 3800
- liver disease**, abdomen, computer assisted tomography, gallbladder disease, varian six second body scanner, 34 cases, 1185
- computer, laboratory diagnosis, liver function, monitoring follow-up, human, 3798
- computer assisted tomography, 600 examinations, 826
- computer assisted tomography, endoscopic retrograde cholangiopancreatography, kidney disease, liver scintiscanning, pancreas disease, retroperitoneal disease, tomography, 359
- drug metabolism, drug protein binding, mathematic model, pharmacokinetics, review, 21
- liver function**, computer, laboratory diagnosis, liver disease, monitoring follow-up, human, 3798
- liver scintiscanning**, computer assisted tomography, endoscopic retrograde cholangiopancreatography, kidney disease, liver disease, pancreas disease, retroperitoneal disease, tomography, 359
- liver vascular resistance**, capillary pressure, liver blood flow, liver capillary, mathematic model, dog, 2062
- liver vein**, needle, portal vein blood pressure, 100 patients, percutaneous transhepatic measurement, chiba needle, method, wedge pressure, 1465
- live vaccine**, attenuated virus, central nervous system, lumbar spine, mathematic model, neurovirulence, poliomyelitis virus, thalamus, virus, virus virulence, neurovirulence assay, monkey, 3492
- lock in amplifier**, signal noise ratio, cycle slip detectors, 1764
- speech, cat, 615
- locomotion**, computer, gait, computer analysis, 3473
- computer model, locomotor system, muscle, 1668
- coordination, electromyography, joint, mathematic model, movement, human, 432
- diagnosis, electromyography, gait, pattern recognition, 19 patients, 1906
- gait, information processing, 2088
- gait, movement, derivative determining technique, 1997
- manipulation, mathematic model, movement, process control, 2796
- mathematics, motoneuron, 1274
- treadmill, motor driven, cat, 705
- locomotor system**, computer model, locomotion, muscle, 1668
- logarithmic amplifier**, SEE amplifier
- logic circuit**, integrated circuit, low current characteristic, 2002
- long bone**, bone reconstruction, osteoporosis, osteosynthesis, internal fixation plate, interdisciplinary approach, 886
- bone strength, elasticity, tensile strength, tibia, dog, 429
- longevity**, artificial heart pacemaker, programmable pacemaker, 37 cases, 2932
- longitudinal data**, growth, information processing, public health, quality control, mixed longitudinal study, multidisciplinary study, netherlands, 2780
- loudness**, annoyance, community, environmental sanitation, noise, perception, pollution, loudness scaling, 256
- auditory discrimination, hearing, loudness discrimination, speech, vowel consonant, 703
- hearing, mathematic model, pitch, 2824
- noise, loudness growth, 100 hz tone, 3529
- loudness discrimination**, acoustic reflex, hearing, tympanic membrane impedance, 899
- auditory discrimination, hearing, loudness, speech, vowel consonant, 703
- hearing, parameter extraction, spectrometry, model, 910
- hearing, noise stimulus, auditory critical bandwidth, 898

- hearing, loudness perception, 2445
- loudness perception**, binaural hearing, hearing, interaural intensity difference, 452
 - hearing, 29 cases, 700
 - hearing, variability, 2633
 - hearing, loudness discrimination, 2445
- loupe**, eye surgery, low vision, microsurgery, prism, visual aid, new device, 2295
 - microlaryngoscopy, new binocular loupe, 2949
- low frequency generator**, computer memory, sine wave generator, digital generator, 959
- low heart output syndrome**, SEE forward heart failure
- low pass filter**, active filter, 3578
- low vision**, braille, electronic calculator, 4 types, 539
 - eye surgery, loupe, microsurgery, prism, visual aid, new device, 2295
 - visual aid, students' experiences, 690
 - visual aid, visual field defect, field expanders, 268
- lubricating agent**, hip, lubrication, prosthesis, synovial fluid, total hip prosthesis, 3145
- lubrication**, biomechanics, joint, elastohydrodynamic lubrication, 2807
 - hip, lubricating agent, prosthesis, synovial fluid, total hip prosthesis, 3145
- lumbar disk**, aneurysm, endoscopy, hypophysis adenoma, sella turcica, telescope, endoscopy, apparatus, neurosurgery, hopkins telescope, 666
- lumbar spine**, attenuated virus, central nervous system, live vaccine, mathematic model, neurovirulence, poliomyelitis virus, thalamus, virus, virus virulence, neurovirulence assay, monkey, 3492
 - mathematic model, spine, spine loading, displacement curve, preload, 885
 - mathematic model, muscle, muscle force, spine, 7 muscle shapes, 430
 - mathematic model, spine, 3129
- luminance**, information processing, mathematic model, night vision, photoreceptor, visual field, 3537
- luminescence**, gamma counting, reference source, 1401
 - infrared radiation, photography, cathodoluminescence, image sensor, 2871
- luminescence dosimeter**, dosimetry, fast neutron radiation, fission neutron radiation, gamma radiation, 2159
- lung**, amnion fluid, breathing mechanics, echography, fetus, time distance recorder, 2163
 - atmosphere, pneumography, pressure transducer, respiration, 1912
 - autoradiography, uranium dioxide u 235, neutron induced autoradiography, rat, 3255
 - breathing muscle, computer, diaphragm, digital computer, lung volume, rabbit, 1994
 - computer, lung disease, mathematic model, scintillation camera, washout curve, xenon 133, and normals, 380
 - computer, diagnosis, radiography, thorax radiography, 2316
 - fourier transform, information processing, pneumography, 2053
 - image processing, microwave radiation, respiration, 2286
 - intestine, leg, lymph flow, lymph protein, lymph vessel, mathematic model, permeability, reflexion coefficient estimation, 1704
 - nebulization, radiography, radioisotope, 2288
 - plutonium dioxide pu 239, alpha radiation, frequency of alpha particles in lung cell, 3253
- lung alveolus**, aerosol, air blood barrier, radioactive aerosol, alveolar microenvironment, review, 648
 - breathing rate, lung pressure, mathematic model, model, 2830
 - hysteresis, lung alveolus surfactant, lung pressure, lung volume, mathematic model, 2808
- lung alveolus surface tension**, lung alveolus surfactant, pulsating bubble evaluation method, laplace law, 2213
- lung alveolus surfactant**, hysteresis, lung alveolus, lung pressure, lung volume, mathematic model, 2808
 - lung alveolus surface tension, pulsating bubble evaluation method, laplace law, 2213
 - model, in vitro, physics, 2816
- lung artery**, artery catheterization, catheter, flush system, infusion system, drip chamber, 1066
- lung artery pressure**, computer, heart catheterization, heart output, heart stroke volume, lung blood volume, mitral valve stenosis, radiocardiography, mitral valve area, 33 patients, 2754
 - mathematic model, pulmonary hypertension, noninvasive measurement, 922
- lung blood flow**, blood, emergency, lung insufficiency, microfilter, filtration rationale, 3280
 - blood volume, great vessels transposition, indicator dilution curve, model, new technique, 3703
 - compartment model, gas exchange, lung diffusion, lung model, lung ventilation, lung ventilation perfusion ratio, inequalities, theoretical analysis, 462
 - mathematic model, nonlinear system, 923
- lung blood volume**, computer, heart catheterization, heart output, heart stroke volume, lung artery pressure, mitral valve stenosis, radiocardiography, mitral valve area, 33 patients, 2754
- lung cancer**, computer assisted tomography, lung metastasis, lung nodule, nodule detection, 357
 - densitometry, heart, lung cyst, lung emphysema, mediastinum, thorax wall, 33 thoracic tomodensitometers, 1061
- lung carcinoma**, cancer diagnosis, computer assisted diagnosis, thorax radiography, 482 cases, 2724
- lung clearance**, mathematic model, radioactive aerosol, scintigraphy, lung burden, detector of adjustable

- response, 1063
- lung closing volume**, carbon dioxide, gas analysis, lung function test, water, acoustic analyzer, 2218
 - computer, respiratory tract disorder, determination, 1991
- lung compliance**, airway, lung elasticity, model, respiration, flow limiting segment, 442
 - airway, elastic tube, forced expiratory volume, tube flow, wave speed theory, 1714
 - airway, flow, lung volume, tube, wave speed limitation, unifying concept, 1713
 - airway resistance, breathing mechanics, measurement device, 2217
 - body plethysmography, computer model, respiration, 439
 - computer, lung mechanics, mathematic model, thorax, least square method, modified forced oscillation technique, 1270
 - functional residual capacity, pressure volume curve, vital capacity, model, human, 3164
- lung congestion**, densitometry, lung density, lung edema, radiation, gamma radiation, samarium 153, 1332
- lung cyst**, densitometry, heart, lung cancer, lung emphysema, mediastinum, thorax wall, 33 thoracic tomodensitometers, 1061
- lung density**, densitometry, lung congestion, lung edema, radiation, gamma radiation, samarium 153, 1332
- lung diffusion**, carbon dioxide, carbon monoxide, fluoride, gas diffusion, helium, mathematic model, oxygen, binary diffusion coefficient, 2828
 - carbon monoxide, helium, sulfur hexafluoride, 3163
 - compartment model, gas exchange, lung blood flow, lung model, lung ventilation, lung ventilation perfusion ratio, inequalities, theoretical analysis, 462
 - convection, gas transport, mathematic model, respiration, green function, 2050
 - equation, gas bubble, neon, nitrogen, oxygen, respiration, counter diffusion, 2051
 - gas exchange, on line digital integration, 2376
- lung diffusion capacity**, carbon monoxide, automatic device, dog, single breath, 164
- lung disease**, computer, lung, mathematic model, scintillation camera, washout curve, xenon 133, and normals, 380
- lung edema**, densitometry, lung congestion, lung density, radiation, gamma radiation, samarium 153, 1332
 - diagnosis, microwave radiation, 656
 - impedance plethysmography, plethysmography, thorax impedance, edema measurement method, 2216
 - microwave radiation, monitoring, diagnosis, 1064
- lung elasticity**, airway, lung compliance, model, respiration, flow limiting segment, 442
 - airway resistance, lung model, mathematic model, nonlinear model, 441
- lung embolism**, artificial heart pacemaker, electrode, embolism, catheter embolism, migrating of retained pacemaker, 1479
 - inferior cava vein filter, nitinol filter, 2597
- lung emphysema**, densitometry, heart, lung cancer, lung cyst, mediastinum, thorax wall, 33 thoracic tomodensitometers, 1061
- lung function**, anesthesia, cost, heart arrest, medical record, monitoring, operating room, techniques, requirement, 3032
 - computer, electrocardiography, exercise, heart rate, oxygen consumption, tidal volume, breath-by-breath respiratory measurements, 1615
 - diaphragm, functional residual capacity, pneumography, 2952
 - oxygen consumption, oxygen electrode, respiration, telemetry, transducer, 2106
- lung function test**, air flowmeter, forced expiratory volume, device, 2607
 - carbon dioxide, gas analysis, lung closing volume, water, acoustic analyzer, 2218
 - computer, 1993
 - computer, gas exchange, lung ventilation, 1992
 - computer, end tidal carbon dioxide tension, functional residual capacity, intensive care, mass spectrometry, monitoring, 2675
 - functional residual capacity, positive end expiratory pressure, measurement instrumentation, 2215
 - lung volume, residual capacity, isopressure flow curve, recording device, 2953
 - comparison chest physician and computer, 3479
- lung impedance**, airway impedance, breathing, lung pressure, healthy man, 3304
 - respiration, forced oscillation method, 1297
- lung insufficiency**, blood, emergency, lung blood flow, microfilter, filtration rationale, 3280
- lung mechanics**, computer, lung compliance, mathematic model, thorax, least square method, modified forced oscillation technique, 1270
- lung metastasis**, computer assisted tomography, lung cancer, lung nodule, nodule detection, 357
- lung model**, airway resistance, lung elasticity, mathematic model, nonlinear model, 441
 - compartment model, gas exchange, lung blood flow, lung diffusion, lung ventilation, lung ventilation perfusion ratio, inequalities, theoretical analysis, 462
- lung nodule**, computer assisted tomography, lung cancer, lung metastasis, nodule detection, 357
- lung parenchyma**, computer assisted tomography, thorax wall, 3067
- lung perfusion**, lung ventilation, lung ventilation perfusion ratio, mathematic model, measurement, estimation,

- lung pressure**, airway impedance, breathing, lung impedance, healthy man, 3304
- breathing rate, lung alveolus, mathematic model, model, 2830
 - hysteresis, lung alveolus, lung alveolus surfactant, lung volume, mathematic model, 2808
- lung sarcoidosis**, computer assisted tomography, sarcoidosis, 6 cases, 2356
- lung vascular resistance**, airway, airway resistance, bronchus tree, entropy, mathematic model, respiration, morphology, branching tree, 434
- lung ventilation**, arterial carbon dioxide tension, breathing, tidal volume, time series, cluster analysis, dog, 295
- breathing rate, electrocardiography, heart rate, sailor, ship, skin temperature, telemetry, workload, seagoin ship, 524
 - bronchography, computer assisted tomography, contrast medium, krypton, xenon, phantom study, 790
 - carbon dioxide, extracorporeal circulation, extrapulmonary oxygenation, oxygenator, sheep, 322
 - compartment model, gas exchange, lung blood flow, lung diffusion, lung model, lung ventilation perfusion ratio, inequalities, theoretical analysis, 462
 - computer, krypton 81m, mathematic model, scintillation camera, clinical examples, lung ventilation measurement, 1475
 - computer, gas exchange, lung function test, 1992
 - functional residual capacity, respiration, occlusion pressure, volunteer, 2052
 - lung perfusion, lung ventilation perfusion ratio, mathematic model, measurement, estimation, 1294
 - oxygen, oxygen consumption, on line measurements, 1813
- lung ventilation perfusion ratio**, body temperature, breathing work, compartment model, panting, respiration control, thermoregulation, dog, 1699
- compartment model, gas exchange, lung blood flow, lung diffusion, lung model, lung ventilation, inequalities, theoretical analysis, 462
 - inert gas, mathematic model, recovery evaluation, 915
 - lung perfusion, lung ventilation, mathematic model, measurement, estimation, 1294
- lung volume**, air flow, analog computer, expiration, inspiration, integrator, respiration, drift suppression, 2377
- airway, flow, lung compliance, tube, wave speed limitation, unifying concept, 1713
 - breathing muscle, computer, diaphragm, digital computer, lung, rabbit, 1994
 - carbon dioxide, diving, dyspnea, exercise, functional residual capacity, helium, hyperbarism, 49.5 ata, 6 divers, 1298
 - digital computer, plethysmography, online measurement, 858
 - hysteresis, lung alveolus, lung alveolus surfactant, lung pressure, mathematic model, 2808
 - lung function test, residual capacity, isopressure flow curve, recording device, 2953
- lymphatic system**, computer model, lymphocyte recirculation, computer model, 1309
- lymph flow**, intestine, leg, lung, lymph protein, lymph vessel, mathematic model, permeability, reflexion coefficient estimation, 1704
- lymphocyte**, adhesion, chromium 51 labelled lymphocyte, mathematic model, T lymphocyte, rat, lymphocyte adhesion, 8
- antilymphocyte serum, HL A antigen, tissue typing, command processor, 2297
 - cell nucleus, cell shape, automated cell classification, cell clusters, subclusters, lymphoreticular tissue, 2299
 - chromosome analysis, computer, karyotype, metaphase, microscopy, automatic metaphase finding, 1563
- lymphocyte recirculation**, computer model, lymphatic system, computer model, 1309
- lymphography**, abdominal cancer, cancer staging, computer assisted tomography, malignant lymphoma, 30 cases, 1601
- lymph protein**, intestine, leg, lung, lymph flow, lymph vessel, mathematic model, permeability, reflexion coefficient estimation, 1704
- lymph vessel**, intestine, leg, lung, lymph flow, lymph protein, mathematic model, permeability, reflexion coefficient estimation, 1704
- macroaggregated albumin technetium 99m**, artery, atheroma, computer, technetium 99m, ulcer, videorecording, dog, 1614
- computer, scintiangiocardiography, scintillation camera, videorecording, 3818
- macrocrania**, computer assisted tomography, hydrocephalus, 93 children, 3764
- macromolecule**, colloid, deoxyribonucleic acid, electric field, fluorescence, induced fluorescence, 1831
- data base, protein binding, file for macromolecular structures, crystallographic studies induced, atomic coordinates, partial bond connectivities, how to use it, 1147
 - mathematic model, molecular structure, ligand interaction, 2401
- macrophage**, bone cement, endoprosthesis, joint capsule, joint total replacement, methacrylic acid methyl ester, wear product reaction, 1110
- magnesium**, brain, brain cortex, copper, electromagnetic radiation, hypothalamus, iron, potassium, sodium, zinc, 1600 mhz, rat, 2564
- calcium, endplate potential, mathematic model, neuromuscular synapse, non linear summation, martin

- formula, frog, 3196
- crystal, thermocouple, ionic thermocurrent measurement, 162
- magnesium acetate**, cell culture, glass roller bottle, 101
- magnesium adenosine triphosphate**, calcium, muscle contraction, muscle model, muscle relaxation, rabbit, 45
- magnesium electrode**, calcium electrode, chloride electrode, ion exchange, microelectrode, potassium electrode, physicochemistry, 1343
- magnesium fluoride**, image intensifier, radiation, 312
- magnet**, artificial heart pacemaker, thorax wall, 15 different implanted demand pacemakers, malfunction evaluation, magnet waving, electrical chest wall stimulation, 1452
 - auditory rehabilitation, ear drum, electromagnetic induction, 687
 - colostomy, ileostomy, erlangen magnetic closure system, 113 cases, 1835
 - esophagus, foreign body, nasogastric tube, stomach, magnetic removal, 613
 - eye foreign body, pulsed magnet, extraction, 3401
 - eyelid reconstruction, facial nerve paralysis, ptosis, eyelid magnets, 276
- magnetic field**, assisted circulation, blood pump, blood pumping, 641
 - behavior, low frequency magnetic fields, monkey, 3488
 - blood, electrolyte balance, erythrocyte, plasma, potassium, sodium, rat, 1243
 - bone disease, bone stress, piezoelectricity, recording, non invasive method, 3005
 - brain, electroencephalography, mechanism, 1340
 - cancer graft, cancer growth, necrosis, neuroblastoma, alternating magnetic field, mice, tumor c 1300, 1396
 - cell, cell membrane potential, 486
 - central nervous system, biological effects, controlled thermonuclear reactor, 2893
 - coil, nuclear magnetic field, coil encapsulation, teflon, 1414
 - digital computer, susceptibility, 2542
 - electric field, environment, high voltage transmission line, biological hazard, 2092
 - electric field, environment, mathematic model, ultra high voltage line, biological hazard, 2091
 - electric interference, electron microscopy, scanning microscopy, ac field compensation, 129
 - electrocardiography, heart, heart electric field, magnetocardiography, rectangular and spherical coordinates, 2590
 - electromagnetic radiation, eye, radiation injury, retina, rat, ultrastructure, 254
 - electron, phantom, roentgen dose distribution, depth dose, 1419
 - electron microscopy, magnetic lens, power supply, drift reduction, 1779
 - evolution, life, 3110
 - magnetocardiography, mathematic model, thorax, 934
 - migration, vision, bird, 166
 - oxygen tension, tissue, oxygen movement, 2829
 - oxyhemoglobin, iron electronic state, human, 214
 - tissue, 2543
- magnetic lens**, electron microscopy, lens, rotation free lens, 3600
 - electron microscopy, magnetic field, power supply, drift reduction, 1779
- magnetocardiography**, cardiology, vectorcardiology, 1864
 - computer model, 1988
 - electrocardiography, heart, heart electric field, magnetic field, rectangular and spherical coordinates, 2590
 - magnetic field, mathematic model, thorax, 934
 - basic studies, volume conduction, 1448
- magnetorheography**, angiography, blood flow, rheology, dog, 3753
- magnification angiography**, brain angiography, brain artery aneurysm, direct serial magnification, 2672
- magnification radiography**, focal point, image quality, modulation transfer function, 724
 - focal point, image quality, model, modulation transfer function, 723
 - focal point, image quality, model, modulation transfer function, 722
 - image quality, skeleton roentgenography, 180 cases, 734
- maladjustment**, hospital, medical record, mental disease, neuroleptic agent, schizophrenia, adolescent, 2369
- malignant exophthalmos**, brain tumor, eye movement, muscle disease, myasthenia gravis, oculomotor paralysis, 118 cases, micromovement recording device, 270
- malignant fibrous histiocytoma**, computer assisted tomography, echography, pancreas pseudocyst, diagnosis of homogeneous mass, histopathology, 1186
- malignant hypertension**, computer, sodium nitroferricyanide, microprocessor, 3057
- malignant lymphoma**, abdominal cancer, cancer staging, computer assisted tomography, lymphography, 30 cases, 1601
- malpractice**, health care delivery, medical engineering, medicolegal aspect, registration, district of columbia, 1242
- mammography**, breast biopsy, computer, data base, diagnosis, pathology, radiography, interclinical cross check, 708 cases, austria, 3430
 - breast cancer, chronic disease, mass screening, model, periodic medical examination, mathematical

- analysis, transient analysis, screening interval, 1250
- breast carcinoma, computer, echotomography, time of flight echography, 3809
- dosimetry, roentgen tube, transmolybdenum tube, 3763
- dosimetry, radiation scattering, back scattering, 3371
- radiation exposure, radiation scattering, intensity of scatter radiation, 3017
- mandible**, mastication, optoelectronic transducer, jaw movement, recording of movements, 1032
 - periodontal membrane, tooth, mechanic behavior, 894
- manganese** 56, laminar air flow, flow measurement, 1379
- manipulation**, locomotion, mathematic model, movement, process control, 2796
- manipulator**, forceps, laparoscopy, sterilization, uterus, bipolar principle, 660
- man machine interaction**, aircraft, model, pilot, 3503
 - computer interface, computer program, digital computer, speech, duvo, 3088
 - computer model, digital computer, 2525
 - computer program, digital computer, computer language, 3229
 - digital computer, task performance, 541
 - digital computer, display system, task performance, 540
 - digital computer, task performance, 1792
 - feedback system, 3606
 - task performance, compensatory tracking, 417
 - task performance, fault diagnosis, 3512
- mannitol**, ammonium, aspartate aminotransferase blood level, brain edema, computer, electroencephalography, encephalopathy, exchange blood transfusion, fatty liver, furosemide, reye syndrome, 7 children, 779
 - ascorbic acid, brain, cerebrospinal fluid, computer, extracellular space, pharmacokinetics, model, rabbit, 859
 - brain depth stimulation, brain edema, electrode, electrode impedance, glucocorticosteroid, seizure, somatomotor epilepsy, visual cortex, cat, 1489
- manometry**, air flow, air velocity, strain gauge transducer, bell manometer, 152
 - amplifier, pressure transducer, strain gauge transducer, 1376
 - blood viscosity, catheter, serum colloid osmotic pressure, continuous measurement, 212
 - thermistor, vacuum, pirani gauge, 3620
 - stainless steel, 3621
- masking**, deafness, hearing, intelligibility, signal noise ratio, 657
- mass screening**, breast cancer, chronic disease, mammography, model, periodic medical examination, mathematical analysis, transient analysis, screening interval, 1250
 - computer, computer assisted diagnosis, electrocardiography, 772
- mass spectrometry**, arterial carbon dioxide tension, arterial oxygen tension, carbon dioxide electrode, oxygen tension electrode, venous oxygen tension, continuous measurement, 3632
 - artificial ventilation, intensive care, 1060
 - computer, information processing, review, method evaluation, clinical chemistry, 334
 - computer, drug analysis, pattern recognition, pharmacology, structure activity relation, 3092
 - computer, fatty acid ester, gas chromatography, phospholipid, triglyceride, 3047
 - computer, end tidal carbon dioxide tension, functional residual capacity, intensive care, lung function test, monitoring, 2675
 - computer, drinking water, organic compound, surface water, water pollution, united states, trace analysis, 3796
 - gas, gas flow, respiration, gas inlet, control, 1347
- mast cell**, cell count, computer analysis, image analysis, quantimet 720, 3408
 - intracellular potential, microelectrode, peritoneum macrophage, measurement techniques, mouse, 159
- mastication**, computer, electromyography, jaw, muscle contraction, man, 1613
 - mandible, optoelectronic transducer, jaw movement, recording of movements, 1032
- mastoid**, bone conduction, model, 3130
- mathematic genetics**, population model, triploidy, 2770
- mathematic model**, acceleration, gravitational stress, hand, neck, human head neck system, dynamic response, predictive model, 3008
 - acceleration, computer model, head, impact, neck, motor vehicle crash victim, calspan 3 d computer simulator, 2426
 - acceleration, cardiovascular system, headache, heart rate, stress, 2812
 - acceleration, computer program, head, impact, muscle, neck, math modelling, volunteers, 1266
 - acoustic impedance, tympanometry, acoustic admittance, w notch, 3518
 - acoustic nerve, hearing, vision, photo counter, 3157
 - action potential, heart muscle fiber, heart ventricle, voltage clamp, 938
 - adenosine triphosphatase, heart muscle contraction, mathematical model, 2424
 - adenosine triphosphatase, adenosine triphosphate, energy transfer, 3495
 - adenosine triphosphate, erythrocyte, glycolysis, human erythrocyte, 3116

- adhesion, chromium 51 labelled lymphocyte, lymphocyte, T lymphocyte, rat, lymphocyte adhesion, 8
- adverse drug reaction, drug monitoring, epidemiology, pattern recognition, pharmacokinetics, public health, 1956
- aggression, behavior, predator prey communities, 14
- airplane pilot, ejection seat, emergency, model, body model, windblast force, aerodynamic force, articulated human body, emergency ejection, 2648
- airplane pilot, biodynamics, model, parachutist, ucin crash victim simulation code, wind loading effect, 3364
- airway, ciliary motility, human airway lengths, 3109
- airway, airway resistance, bronchus tree, entropy, lung vascular resistance, respiration, morphology, branching tree, 434
- airway resistance, lung elasticity, lung model, nonlinear model, 441
- airway resistance, breathing mechanics, breathing muscle, breathing work, force velocity relationship, 1271
- algorithm, computer, electrocardiography, qrs complex, vectorcardiography, wave recognition algorithm, chest, 3180
- amygdaloid nucleus, electroencephalography, kindling, first approximation model, 2475
- analog model, bone marrow, 3282
- analog model, artery flow, 918
- anatomy, cell structure, embryogenesis, gastrulation, tissue, 3510
- angiography, cast, elasticity, heart left ventricle, heart muscle, urethan, calculation of young's elastic modulus, 433
- anisotropy, heart muscle membrane potential, membrane potential, muscle, nerve, syncytium, dog, 3184
- anisotropy, aorta strip, artery, viscoelasticity, dog, 1675
- aorta stenosis, aorta wall, turbulent wall pressure measurement, 1711
- aphakia, cornea transplantation, intraocular pressure, trabecular meshwork, 2800
- artery, artery elasticity, blood pressure, doppler ultrasound flow meter, echography, elasticity, 435
- artery, blood pressure, length force relation, volume pressure relation, 2794
- artery, blood vessel muscle, brain artery, medial brain artery, smooth muscle, orientation, 1080
- artery, elasticity, model, hydraulic model, elastic non uniformity, 46
- artery, blood vessel, arterial branching, 69
- artery circumference, artery resistance, blood pressure, heart output, measurement method, 3166
- artery flow, blood flow, blood pressure, pressure flow relationship, 2833
- artery flow, hemodynamics, pulsatile flow, 2060
- artery flow, atherosclerosis, coronary artery, coronary artery blood flow, pulsatile flow, rheology, flow analysis, 2454
- artery murmur, artery occlusion, blood flow, cardiovascular murmur, phonocardiography, 1308
- artery wall, linear model, 2453
- artificial kidney, hemodialysis, tubular haemodialyses, ultrafiltration, dialysate concentration, 2226
- atherosclerosis, blood flow, 2456
- attenuated virus, central nervous system, live vaccine, lumbar spine, neurovirulence, poliomyelitis virus, thalamus, virus, virus virulence, neurovirulence assay, monkey, 3492
- averaging, evoked response, wiener filter, wiener filter vs averaging, 2229
- band pass filter, information processing, nerve potential, vision, visual stimulation, non linear spatial filter, 912
- barany test, vestibular nystagmus, 1662
- basilar membrane, cochlea, cochlea fluid, 2 dimensional model, 59
- basilar membrane, non linear model, 2413
- basilar membrane, cochlea, linear and nonlinear model, 1666
- behavior, n person game, 2773
- behavior, decision, motivation, nerve cell network, statistics, stimulus, behavioral mode selection, 399
- benzimidazole derivative, cell membrane, mitochondria, oxidative phosphorylation, in vitro, model study, 2764
- binaural hearing, directional hearing, echolocation, 3155
- bioavailability, blood cell aggregation, drug clearance, drug metabolism, drug protein binding, enzyme, liver blood flow, pharmacokinetics, review, 3108
- biofeedback, circadian rhythm, heart, sweating, 2791
- biofeedback, cheyne stokes breathing, chronic granulocytic leukemia, hematopoietic disease, nonlinear system, process control, respiration, 1299
- biology, computer, ecology, model, algorithm, 1788
- biomechanics, muscle, muscle contraction, 1667
- biomechanics, intervertebral disk, spine, workload, systems identification scheme, linear viscoelastic properties, 3140
- biopharmaceutics, drug release, gastrointestinal tract, pharmacokinetics, 1627
- blood, erythrocyte, sound, erythrocyte shape and propagation, 2821
- blood flow, indicator dilution curve, pulsatile flow, 476

- blood flow, body temperature, heart output, skin temperature, transient response, human, thermoregulation, 448
- blood flow, indicator dilution curve, vascular bed, 1715
- blood flow, circulation, heart left ventricle, hemodynamics, parameter extraction, 469
- blood glucose, glucagon, glucose tolerance test, insulin release, model studies, 3113
- blood oxygen tension, countercurrent multiplier system, gas, oxygen electrode, swimming device, experimental model verification, eel, 914
- blood pressure, heart left ventricle, heart ventricle pressure, statistics, ape, self modelling, 1712
- blood pressure, blood vessel resistance, kidney failure, renovascular hypertension, sodium, water, 2420
- blood rheology, carbon dioxide, gas diffusion, hemoglobin, oxygen, ph, 1307
- blood vessel, shear stress, shear strength, blood vessel radii, 447
- blood viscosity, capillary permeability, hematocrit, serum protein, 3541
- blood viscosity, flow, viscosity, radial viscosity, 1306
- body, heat transfer, homeothermia, newborn, thermoregulation, body insulation, critical size, 897
- body, electrocardiography, thorax electric field, 1314
- body weight, casein, nutrient, rat, 13
- bone piezoelectric potential, collagen, piezoelectricity, stress generated potential, 79
- bone piezoelectric potential, piezoelectricity, bent long bone, 2068
- brain, memory, nerve cell network, associative memory, 3187
- brain blood flow, carbon dioxide tension, oxygen tension, 470
- brain cortex, electrocardiography, hippocampus, hippocampus potential, dorsal hippocampus slope, 2476
- brain cortex, electrocorticography, electroencephalography, meninx, source tangential layer, 492
- breast carcinoma, cancer, survival, 1642
- breathing, nerve conduction, vagus nerve, rhythmogenesis, lotka volterra model, 467
- breathing rate, lung alveolus, lung pressure, model, 2830
- brightness, color vision, visual system, brightness generation, 1693
- burn, evaporation, heat radiation, skin, temperature distribution, 2040
- calcium, endplate potential, magnesium, neuromuscular synapse, non linear summation, martin formula, frog, 3196
- calcium, nerve cell membrane conductance, pacemaker nerve cell, 3554
- camera, modulation transfer function, scintigraphy, scintillation, statistics, 1921
- cancer, cancer chemotherapy, diagnosis, radiotherapy, statistics, therapy evaluation, 2361
- cancer, computer program, drug half life, folinate calcium, kidney failure, methotrexate, pharmacokinetics, 5 patients, 3435
- cancer growth, growth, stability analysis, 2003
- cancer growth, computer program, information processing, statistics, gompertz function, fortran, 2782
- cancerogenesis, cell metabolism, chemical kinetics, 2014
- capillary, capillary flow, erythrocyte, oxygen transport, 461
- capillary flow, conductivity index, 1706
- capillary pressure, liver blood flow, liver capillary, liver vascular resistance, dog, 2062
- carbon dioxide, carbon monoxide, fluoride, gas diffusion, helium, lung diffusion, oxygen, binary diffusion coefficient, 2828
- carbon monoxide, carboxyhemoglobin, fetus, mother, uptake and elimination, sleep, 464
- cardiovascular system, simulator, simulation requirement, 2176
- cardiovascular system, dynamic test method, 921
- cell, cell population, mitosis, autooscillation delay, 391
- cell, cytology, pattern recognition, uterine cervix cytology, 2509
- cell adhesion, cell contact inhibition, cell fusion, metastasis, van der waals force, 1263
- cell division, cell proliferation, population model, 2398
- cell division, growth, mitochondria, 1635
- cell growth, feedback system, 1650
- cell growth, cell motion, displacement, 1646
- cell kinetics, chemical kinetics, chemotracer, 2402
- cell membrane, ion transport, membrane, osmotic pressure, thermodynamics, 2437
- cell membrane, ion transport, membrane, osmotic pressure, thermodynamics, 2436
- cell membrane, cell membrane permeability, diffusion, fluidics, 2431
- cell membrane, cell membrane transport, chemical kinetics, 2171
- cell membrane, cell membrane impedance, ion transport, nerve cell, 2079
- cell membrane, endothelium cell, pinocytosis, vesicular transport, 18
- cell membrane, cell membrane potential, electric field, ionic solution, 3176
- cell membrane, ion exchange, sodium channel, 2848
- cell membrane, cell membrane potential, noise generator, 2843
- cell membrane conductance, membrane, noise, 2409
- cell membrane permeability, epithelial cell, thermodynamics, tracer flux ratio, 896

- cell membrane permeability, compartment model, electrolyte, epithelial cell, weak electrolyte, 20
- cell membrane permeability, hodgkin huxley equation, nerve cell membrane, complex admittance, squid, 2841
- cell membrane potential, ion transport, thermodynamics, 1676
- cell membrane receptor, muscle contraction, kinetic model, 2814
- cell motion, pattern recognition, markov model, 884
- cell population, mitosis, self oscillation, density control, 2008
- cellular immunity, dose response, migration inhibition, migration assay, 19
- cerebellum, computer model, nerve cell network, purkinje cell, frog, 487
- cerebellum cortex, computer model, nerve cell network, purkinje cell, frog, 1717
- cerebellum cortex, mossy fiber, temporal behavior, turtle, 2087
- cerebellum cortex, golgi cell, nerve cell network, golgi cell function, 3558
- cerebrospinal fluid pressure, hemodialysis, kidney failure, urea, treatment guideline, 477
- chemical kinetics, compartment model, 2015
- chemical kinetics, computer model, evolution, life, prokaryotic cell, 2774
- chemical kinetics, enzyme kinetics, 413
- chemical kinetics, linear system, 1640
- chemotaxis, phagocytosis, polymorphonuclear granulocyte, markov model, 396
- chronic disease, heart disease, ischemic heart disease, 1703
- ciliary motility, cilium, porous medium model, 50
- cilium, flagella, twisted filament, displacement, sliding, 37
- circadian rhythm, 1645
- circulation model, monitoring, systolic blood pressure, elastic reservoir, 1701
- clearance, heart output, indicator dilution curve, unified estimation theory, 73
- cobalt therapy, computer model, radiotherapy, 1965
- cochlea, hearing, 2823
- cochlea, coding, correlation function, hearing, signal processing, reverse correlation technique, 3154
- cochlea microphonic potential, hearing, 2442
- cochlea microphonic potential, frequency discrimination, neural tuning curve, 2439
- cochleography, evoked response audiometry, method, frequency specific information, 3528
- collagen, cortical bone, osteon, piezoelectricity, stress frequency, 80
- colon tenia, electricity, hodgkin huxley equation, smooth muscle, smooth muscle tone, guinea pig, 2037
- color vision, visual system, opposite color difference, anticolor, 3160
- compartment model, creatinine blood level, hemodialysis, peritoneal dialysis, urea blood level, uremia, 3169
- compartment model, stochastic model, 2392
- compartment model, realizability, delays, 3502
- computer, multiple trauma, nomogram, prognosis, respiration, trauma, 2 prognostic indices, 172 cases, 426
- computer, mortality, multiple trauma, trauma, trauma indices, predictions, 425
- computer, heart valve prosthesis, thrombogenesis, tilting disk prosthesis, thrombogenic site prediction, 1236
- computer, krypton 81m, lung ventilation, scintillation camera, clinical examples, lung ventilation measurement, 1475
- computer, epidemiology, information processing, 339
- computer, pathophysiology, 406
- computer, lung, lung disease, scintillation camera, washout curve, xenon 133, and normals, 380
- computer, lung compliance, lung mechanics, thorax, least square method, modified forced oscillation technique, 1270
- computer, retina detachment, retina rupture, sclera buckling procedure, computer localisation, 2314
- computer, countercurrent multiplier system, kidney function, 2457
- computer model, countercurrent multiplier system, kidney tubule absorption, sodium, urea, transient simulation, steady state simulation, 473
- computer model, hospital management, nursing home, marker chain model, 1150
- computer model, neuromuscular synapse, interspike interval sequence, 3193
- computer model, nerve conduction, ranvier node, 2847
- computer model, countercurrent multiplier system, gas exchange, swimming device, 913
- computer program, digital computer, display system, molecular structure, pdp 10, 420
- conductivity, erythrocyte, erythrocyte size, 3556
- contrast, muller lyer illusion, perception, 2047
- contrast, darkness, light, retina image, visual system, human system, 1697
- convection, gas transport, lung diffusion, respiration, green function, 2050
- coordination, electromyography, joint, locomotion, movement, human, 432
- coronary artery blood flow, coronary artery circulation, heart muscle oxygen tension, coronary bed on inhomogeneity, rat, 3701
- cost, epidemiology, immunization, model, statistics, 3509

- cost, decision, diagnosis, differential diagnosis, ischemic heart disease, mathematics, prognosis, statistics, expected outcome loss, 759
- cost, epidemiology, immunization, 3508
- crossing over, deoxyribonucleic acid, deoxyribonucleic acid strand, optic chiasm, four strand model, interference, 2787
- cupula, otolith, semicircular canal, sensation interaction, 436
- cybernetics, information science, perception, 419
- decision, model, survey, model testing, 2765
- decision theory, diagnosis, neurology, 338
- decision theory, diagnosis, multivariate analysis, symptoms, 337
- decision theory, diagnosis, meningitis, 248
- decompression sickness, gas bubble, gas cavitation nuclei, 463
- defibrillation, model, skin burn, skin conductance, defibrillator default, human, 450
- deprivation, skin, finite deformation theory, 2035
- desmosome, nerve cell, nerve fiber, nerve resistance, septum resistance, nexuses, earthworm, 997
- diaphragm, muscle fiber membrane potential, neuromuscular system, rat, 1315
- diarrhea, epidemic, pattern recognition, 139 infants, 2781
- digital filtering, evoked response, fourier transform, 1750
- dipole theory, nerve fiber potential, 3175
- disease carrier, epidemic, threshold theorem, 2779
- diuresis, henle loop, hydropenia, kidney medulla, kidney tubule, urea, human kidney, 2460
- dorsal spinocerebellar tract, nerve cell membrane steady potential, nerve cell potential, potassium, afterhyperpolarization, cat, 3179
- dosimetry, phantom, radiation exposure, japanese adult, 99
- drug administration route, drug half life, pharmacokinetics, 1628
- drug delivery system, 369
- drug dose, pharmacokinetics, computer, optimization, method, 1629
- drug metabolism, drug residue, mammals, 3120
- drug metabolism, drug protein binding, liver disease, pharmacokinetics, review, 21
- echolocation, frequency stabilization, horseshoe bat, 3530
- ecology, population model, stability analysis, liapunov method, 423
- ectopic beat, electrocardiography, extrasystole, stochastic model, poisson process, 21 patients, 2196
- egg, egg transport, uterine tube, random walk model, 438
- elasticity, flow, lecithin, shear rate, suspension, viscosity, 1710
- elasticity, urethra urine flow, female urethra, 925
- electric field, environment, magnetic field, ultra high voltage line, biological hazard, 2091
- electric field, frequency analysis, nerve fiber membrane potential, volume conductor, 932
- electrocardiography, limit cycle model, 1733
- electrode, electroencephalography, meninx, scalp, 2469
- electroencephalography, joint, movement, walking, automatic calculation method, human, 445
- electroencephalography, canonical expansion, analysis, 3331
- electroencephalography, gaussian curve, comment, 2835
- electroencephalography, evoked cortical response, evoked lateral geniculate response, information processing, cat, 89
- electroencephalography, multivariate analysis, parametric time series model, 936
- electromagnetic radiation, radiation absorption, man, animal, 2567
- electromyography, hip, ligament, forces evaluation, 437
- electromyography, spectrometry, 1754
- electromyography, nonstationary model, 2085
- electromyography, forearm, muscle, neuromuscular system, 2427
- electronystagmography, nystagmus, vestibuloocular reflex, physiological vs pathological conditions, 3135
- endplate potential, postsynaptic membrane, postsynaptic potential, 1321
- energy transfer, heart work, thermodynamics, 1678
- energy transfer, motor unit, neuromuscular system, energy optimal control, 1722
- environment, dispatch strategy, power generator, power consumption, 1439
- enzyme, hypercycle model, 1253
- epidemic, 1255
- epidemic, inactivated virus vaccine, influenza a, influenza virus a, stochastic model, vaccination, 3499
- epidemiology, spatial spread, kendall's pandemic threshold theorem, 2004
- erythrocyte, static equilibrium configuration, 1700
- erythrocyte, erythrocyte membrane, spectrin, human, 2423
- evoked cortical response, evoked visual response, hysteresis, photostimulation, 2464
- excitatory postsynaptic potential, inhibitory postsynaptic potential, nerve cell, stochastic model, automation model, 2466

- excitatory postsynaptic potential, nerve cell potential, spike, interspike time distribution, 2849
- exercise, muscle, muscle temperature, thermodynamics, thigh muscle, analytical solution, human, 2434
- exercise, expiration, inspiration, respiration, 465
- extrafusal muscle fiber, fusimotor muscle, muscle spindle, beta nerve fiber, chelonian spindle, 496
- eye movement, nystagmus, saccadic eye movement, 2477
- eye movement, 665
- eye movement, feedback system, head movement, vision, eye head coordination, 1669
- eye temperature, light, retina, transient thermal response, 2039
- feedback system, movement, muscle contraction, muscle tone, human arm model, 3523
- feedback system, nerve cell potential, model encoders, 1331
- femur, fracture, hip, implant, joint total replacement, prosthesis, 3131
- fet semiconductor, signal noise ratio, 2485
- fetus, hypoxia, oxygen consumption, placenta, uterus contraction, 205
- flow, indicator dilution curve, fluid flow rate, 1707
- flow, thermodynamics, urinary tract, parallel flow tube, 2061
- fluorescence, pattern recognition, system identification, moments, 2895
- frequency modulation, nerve cell network, 2084
- gastrocnemius muscle, muscle isometric contraction, linear equation, rat, 1660
- gastrointestinal motility, gastrointestinal tract, 2089
- gene, stability, 6
- genetic code, prewobble hypothesis, 2386
- granular cell, hippocampus, information science, nerve cell, synapse, information theory, 2081
- growth, plant, leaf distribution, 2408
- hand dorsal interosseus muscle, motor unit, muscle isometric contraction, human, 929
- head trauma, injury, model, skull fracture, response probability density function technique, 3365
- hearing, loudness, pitch, 2824
- heart automaticity, heart rhythm, sinus node, weakly coupled relaxation oscillators, 2473
- heart contraction, heart left ventricle wall, fluid dynamics, 2038
- heart contraction, heart fibrillation, rayleigh distribution, 87
- heart muscle, hill model, muscle contraction, muscle isometric contraction, analytical solution, 3522
- heart muscle, vector string descriptor, 2831
- heart muscle contraction, heart muscle hypertrophy, rat, heart muscle isometric contraction, 889
- heart muscle fiber, hodgkin huxley equation, nerve fiber membrane, hodgkin-huxley model, 2078
- heart muscle ischemia, ischemic heart disease, ischemic tension development, regionally ischemic heart muscle, 2058
- heart rhythm, phase control, 881
- hematology, gamma radiation, radioisotope, scintigraphy, 2465
- higher nervous system activity, learning, neural theory, 930
- hippocampus, nerve cell network, nerve cell potential, ca sub 3, 3192
- hodgkin huxley equation, nerve fiber membrane capacitance, squid, 2840
- hydrodynamics, semicircular canal, utricle, fluid flow, 440
- hysteresis, lung alveolus, lung alveolus surfactant, lung pressure, lung volume, 2808
- identification, information science, retina, system analysis, 2045
- illumination, retina horizontal nerve cell, synapse, uniform illumination, 493
- inert gas, lung ventilation perfusion ratio, recovery evaluation, 915
- information processing, luminance, night vision, photoreceptor, visual field, 3537
- information processing, synapse, 77
- information processing, nerve cell membrane potential, nerve cell network, nonlinear system, statistics, 2069
- information processing, 3497
- intestine, leg, lung, lymph flow, lymph protein, lymph vessel, permeability, reflexion coefficient estimation, 1704
- intestine absorption, intestine blood flow, 10 models, 3542
- intestine motility, 3521
- kidney, transient behavior analysis, 3171
- kidney, liver, substrate, time dependence, 3165
- kidney medulla, kidney tubule absorption, single loop solute cycling model, 3545
- kidney tubule absorption, puncture, variance model, 2057
- lake water, polychlorinated biphenyl, sediment, lake michigan, material balance study, 1246
- lateral eye, nerve cell potential, limulus, 1696
- lateral geniculate body, nerve cell network, cat, 3186
- lateral geniculate body, nerve cell potential, visual field, space time weight function, 3185
- lateral geniculate body, nerve cell potential, red nucleus, reticular formation, spike, markov model, ventrobasal complex, 1313

- learning, memory, nerve cell network, pattern recognition, potassium channel, sodium channel, synapse, 1316
- light absorption, photolysis, 2557
- locomotion, manipulation, movement, process control, 2796
- lumbar spine, spine, spine loading, displacement curve, preload, 885
- lumbar spine, muscle, muscle force, spine, 7 muscle shapes, 430
- lumbar spine, spine, 3129
- lung artery pressure, pulmonary hypertension, noninvasive measurement, 922
- lung blood flow, nonlinear system, 923
- lung clearance, radioactive aerosol, scintigraphy, lung burden, detector of adjustable response, 1063
- lung perfusion, lung ventilation, lung ventilation perfusion ratio, measurement, estimation, 1294
- macromolecule, molecular structure, ligand interaction, 2401
- magnetic field, magnetocardiography, thorax, 934
- mechanoreceptor, nerve cell potential, nonlinear system analysis, crayfish, 3194
- medical education, radiography, radiotherapy, photon path, path visualization, 1966
- membrane, membrane permeability, jump and electro diffusion description, 389
- membrane model, goldman hodgkin katz equation, 74
- membrane potential, voltage clamp, jump and continuous description, 481
- membrane potential, ac properties, bipolar membrane, 1324
- membrane potential, nonlinear system, spike, finite cable model, cable model, 1312
- memory, nerve cell potential, synapse, memory storage capacity, 3181
- memory, neurotransmitter, synapse transmission, non linear model, 2235
- metabolism, metabolism analysis, 421
- microphone, probe tube microphone, 195
- microphone, signal noise ratio, microphone array, 194
- model, muscle contraction, kinetics, 2801
- model, modulator, sinus node, pulse frequency modulator, 3183
- molecular structure, mutation rate, 422
- motor unit, muscle contraction, cybernetic control model, 2813
- motor unit, muscle contraction, muscle isometric contraction, recruitment, rate coding, 1661
- movement, muscle contraction, voluntary movement, optimal voluntary control, 1659
- muscle contraction, two state model, 2032
- nerve cell, parameter estimation, 937
- nerve cell, volterra representation, 1726
- nerve cell network, retina, object identification, 682
- nerve cell network, 2834
- nerve cell network, seizure, spatiotemporal pattern, 1327
- nerve cell network, rhythmic activity, spike, snail, 1728
- nerve cell network, 2073
- nerve cell potential, retina ganglion cell, retina ganglion cell potential, interspike interval, goldfish, 2046
- nerve cell potential, firing interval moment, 3560
- nerve cell potential, spike, statistics, 3557
- nerve conduction, nerve potential, volume conductor, 1739
- nerve conduction, nerve potential, spike interval, 1328
- nerve conduction, nerve fiber membrane potential, 3189
- nerve conduction, nerve potential, local impulse existence, 3559
- nerve conduction, temporal stability, 2846
- nerve excitability, nerve fiber, 2480
- nerve potential, optimal filtering, 1723
- nervous system, 1323
- neurotransmitter, transmitter kinetics, 1734
- nonlinear system, pupil reflex, black box, 3158
- nonlinear system, vision, spatial perception, 1691
- nonlinear system, vision, 2448
- oculomotor nerve, oscillation, vestibular system, vision, visual acuity, control task, performance, 3515
- oscillation, protein synthesis, series expansion, 2396
- oscillation, rotation, vestibular system, phase characteristic, phase lead, 3133
- oxygen, oxygen electrode, transfer coefficient, 1004
- oxygen electrode, nonuniform diffusion model, 566
- pattern recognition, vision, visual adaptation, spatial filtering, local adaptation, 1290
- perception, calibration equation, 873
- pharmacokinetics, multiple linear regression, numerical algorithm, 2766
- photoreceptor, system identification, quasi white random signals, calliphora, 1692
- population growth, population model, equilibrium, 2776

- population model, galton watson process, immigration, 27
- population model, weapon, arms race, 2784
- population model, switching effect, 2771
- radiation dose fractionation, radiotherapy, tolerance dose, volume dependence, 1341
- retina horizontal nerve cell, graded potentials amplification, 484
- retina rod, current spatial distribution, rod cell potential, frog, 85
- rib, anatomical model, 3134
- smooth muscle, viscoelasticity, 3150
- soft tissue, viscoelasticity, nonlinear system, 3520
- spectral sensitivity, visual pigment, techniques, 1097
- speech, vocal system, inverse filtering, 614
- speech, 1685
- speech, vocal cord, man, 41
- spike, vestibulocochlear organ, pigeon, 3198
- stomach emptying, 475
- stress, vibration, visual tracking, whole body vibration, conceptual stress study model, 3141
- trichloroacetic acid, trichloroethanol, trichloroethylene, uptake, excretion, metabolism, mathematical model, 381
- uterine cervix, uterine cervix dilatation, force dilatation, tissue rupture, 1277
- vestibuloocular reflex, quick phase generation, cat, 3496
- vision, lie group, computation, 2825
- vision, visual cortex, development, columnar organization, 459
- 3118
- self organizing structure, 1639
- donnan potential, 84
- mathematics**, circadian rhythm, nerve cell network, swimming, differential equation, fish, 3553
- cost, decision, diagnosis, differential diagnosis, ischemic heart disease, mathematic model, prognosis, statistics, expected outcome loss, 759
- locomotion, motoneuron, 1274
- model, population dynamics, statistics, whale, 9
- may hegglin malformation**, calcium, thrombocyte, normal values, method, atomic absorption spectrometry, 618
- measurement**, calorimetry, specific heat, low temperature calorimeter, 1798
- cornea thickness, evaluation of an electronic meter, 16 subjects, 2240
- mechanoreceptor**, computer model, nerve cell potential, nonlinear systems analysis, crayfish, 3195
- frequency analysis, sensory system, nonlinear analysis, insect, 1329
- mathematic model, nerve cell potential, nonlinear system analysis, crayfish, 3194
- receptor potential, skin receptor, potential recording, insect, 2256
- medial brain artery**, aphasia, brain infarction, computer assisted tomography, embolism, stroke, 60 cases, 1195
- artery, blood vessel muscle, brain artery, mathematic model, smooth muscle, orientation, 1080
- medial brain artery occlusion**, brain blood flow, computer assisted tomography, xenon 133, monkey model, 1584
- medial forebrain bundle**, brain depth stimulation, lateral hypothalamus, nerve cell potential, strength duration curve, rat, 3182
- median nerve**, electrostimulation, feedback system, perception, prosthesis, 2262
- mediastinum**, artificial heart pacemaker, electrode, sinus node, transmediastinal atrial sensing electrode placement, atrial programmed pacemaker, 31 cases, 1053
- computer assisted tomography, hyperparathyroidism, neck, parathyroid adenoma, 10 cases, 797
- densitometry, heart, lung cancer, lung cyst, lung emphysema, thorax wall, 33 thoracic tomodensitometers, 1061
- mediastinum mass**, computer assisted tomography, diaphragm hernia, mediastinum tumor, omentum, omentum hernia, case report, 1207
- mediastinum tumor**, computer assisted tomography, diaphragm hernia, mediastinum mass, omentum, omentum hernia, case report, 1207
- medical assessment**, behavior, communication, cosmonaut, space flight, space time dialogue, 295
- medical audit**, clinical chemistry, computer, laboratory test, continuing education, control of overutilization, 3794
- medical documentation**, computer, health care delivery, library, patient care, public health service, patient care, literature coordination, 2695
- data base, medical literature, retrieval system, query system, 3468
- data base, information processing, medical record, gfr, 3467
- data base, information processing, model, postgraduate education, retrieval system, medlars, medline, index medicus, usa, problem oriented medical data, 2751
- diagnosis, thesaurus, 3404
- medical education**, computer, medical school, multiple choice test, u.k., 1558

- computer, decision, learning, u.k., 1557
- computer, graduate education, conceptual model, canada, 3792
- digital computer, plato, 329
- epidemiology, public health school, research, united states, three dimensional model, 2389
- mathematic model, radiography, radiotherapy, photon path, path visualization, 1966
- medical engineering, clinical engineering, engineer certification, 862
- television, videorecording, 412
- medical electronics**, electric interference, interference simulator, 104
- medical engineering**, cardiology, electric accident, electronic instrument, 2591
 - cost, hospital engineering, medical instrumentation, 300 bed, 500 bed hospital, 11 cleveland hospitals, 1241
 - digital computer, microprocessor, instrumentation, application, 2483
 - education, hospital, paramedical education, internship approach, 2382
 - education, hospital, paramedical education, usa, 2381
 - electric accident, electrocardiography, monitoring, 748
 - electric accident, electric device, hospital, monitoring, power supply, electrical plug, safety precaution, 1138
 - health care delivery, malpractice, medicolegal aspect, registration, district of columbia, 1242
 - health service, technological impact, 2576
 - hospital, medical instrumentation, 861
 - implant, integrated circuit, review, 526
 - medical education, clinical engineering, engineer certification, 862
 - telemetry, review, design, 2115
- medical examination**, car driving, physical disability, 3369
- medical instrumentation**, automation, sewage treatment, water treatment, netherlands, 3208
 - bioengineering, cost effectiveness, hospital, 450 beds hospital, 1621
 - biofeedback, pain, placebo, placebo effect, 1887
 - conductivity, electric accident, floor covering, gas discharge, safety, 2292
 - cost, hospital engineering, medical engineering, 300 bed, 500 bed hospital, 11 cleveland hospitals, 1241
 - differential amplifier, integrated circuit, 951
 - electrocardiography, electrode, exercise electrocardiography, hyperventilation, quality control, standards, task force, 3291
 - hospital, medical engineering, 861
 - paramedical education, public health service, technician, 382
- medical jargon**, information processing, medical record, 3466
- medical journal**, communication, information science, medical research, misinterpretation by lay press, newsworthiness, 863
- medical literature**, adverse drug reaction, computer, bibliometry, bibliometric analysis, 2371
 - data base, medical documentation, retrieval system, query system, 3468
 - medical record, otorhinolaryngology, simplified filing system, 3469
- medical record**, administration, computer, information processing, nuclear medicine, france, nancy, 2749
 - algorithm, digital computer, outpatients, 3084
 - ambulatory care, computer, cost benefit analysis, information processing, combined with manual techniques, indianapolis, 1609
 - ambulatory care, computer, nurse, 837
 - anesthesia, computer, vs man made record, 758
 - anesthesia, cost, heart arrest, lung function, monitoring, operating room, techniques, requirement, 3032
 - automation, coding, automatic coding, natural language text processing, 1226
 - automation, disease classification, index, pathology, snop vs icd, 2744
 - behavior, computer, interview, problem oriented record, 2368
 - body weight, computer, obesity, medical condition evaluation, 13110 examinations, 3848
 - breast cancer, classification, computer assisted diagnosis, treatment selection, 26 cases, 761
 - case finding, multiphasic testing, outpatient department, multiphasic screening group, chart abstract group, chart review group, comparisons, 835
 - classification, coding, diagnosis, index, pathology, german, 341
 - clinical study, information processing, pharmacotherapy, 2750
 - computer, hospital management, uk, nhs, 3089
 - computer, nomenclature, 3085
 - computer, information processing, radiotherapy, 1196
 - computer, information processing, 841
 - computer, general practice, health center, health visitor, information processing, nursing, public health service, social worker, real time management, great britain, 840
 - computer, radiotherapy, data entry system, 3456
 - computer, surgery, machine output, rationalization, 1224
 - computer, large computer, computerization problem, 2367
 - computer, information system, intensive care, newborn, data error rate, 2364

- computer, electrocardiography, monitoring, 24 hr monitoring, 343
- computer, dyspnea, forced expiratory volume, pneumoconiosis, subjective appreciation, 3847
- computer, obstetrics, perinatology, statistics, 370
- computer, mini record, johns hopkins hospital, 1567
- computer, radiotherapy, case recording, 3804
- computer interface, digital computer, speech synthesizer, telephone enquiry, 3086
- computer program, data base, information processing, pdp 12, 1610
- computer program, radiography, darr, automatic documentation, 1981
- computer program, hospital service, information processing, capo program, canada, 1980
- computer program, hospital management, public health service, mumps, 2747
- computer program, hospital management, public health service, mumps, 2746
- computer program, hospital management, information processing, public health service, mumps, u.s.a., 2745
- computer program, information processing, microprocessor, mumps, 3044
- computer program, retrieval system, mumps, 2366
- computer program, experimental animal, nonhuman primate, 2363
- computer program, radiography, automatization, 376
- computer program, digital computer, fortran discharge summary, cobol ibm 370/158, 374
- computer terminal, user compatible terminal, 838
- data base, gastroenterology, information processing, 1611
- data base, model, retrieval system, indexing, 1608
- data base, data protection, 1225
- data base, information processing, medical documentation, gfr, 3467
- data base, information processing, sari, 372
- diagnosis, thesaurus, german thesaurus, compatibility, 1612
- digital computer, electrocardiography, simplified record, 1227
- digital computer, lexicon, 2748
- digital computer, literature, retrieval system, review, 836
- hospital, maladjustment, mental disease, neuroleptic agent, schizophrenia, adolescent, 2369
- hospital personnel, mental hospital, training, problem oriented record, 2370
- information processing, medical jargon, 3466
- information processing, information retrieval, management, 373
- medical literature, otorhinolaryngology, simplified filing system, 3469
- microfilm, patient care, 340
- radiology, retrieval system, speech, patient name, 3012
- retrieval system, computer language, pdp 10, 1979
- live long record, automatic summary, 375
- medical research**, communication, information science, medical journal, misinterpretation by lay press, newsworthiness, 863
- medical school**, computer, medical education, multiple choice test, u.k., 1558
- medical staff**, hospital, intensive care, 197
- medicolegal aspect**, health care delivery, malpractice, medical engineering, registration, district of columbia, 1242
- medlars**, data base, literature, retrieval system, request analysis, medline, 1607
- medulloblastoma**, brain angiography, brain tumor, cerebellum tumor, computer assisted tomography, ependymoma, hemangioblastoma, 22 children, 3455
- cobalt therapy, dosimetry, treatment technique, 3376
- megavoltage radiotherapy**, betatron, dosimetry, radiotherapy, tiddue maximum ratio, tumor maximum ratio, 2482
- betatron, whole body radiotherapy, arc therapy, 2666
- bone, dosimetry, radiation attenuation, roentgen dose distribution, 2096
- brems radiation, spectrometry, half value layer, 5-40 mev, 587
- brems radiation, material choice, 3248
- cobalt 60, radiation depth dose, radiation scattering, corrections, 1418
- cobalt therapy, radiation depth dose, radiation scattering, dose correction, 3668
- cobalt therapy, computer, dose calculation, central axis dose, 2741
- collimator, display system, fast electron therapy, linear accelerator, collimator positioning device, 2659
- computer, dosimetry, linear accelerator, 3081
- dosimetry, tissue compensator, 3762
- dosimetry, linear accelerator, 3666
- dosimetry, 10 mv, 591
- dosimetry, linear accelerator, radiation detection, silicon diode, 2664
- dosimetry, radioactivity, roentgen radiation, 45 mv, 732
- fast electron radiation, gamma radiation, thermoluminescence dosimeter, lif response, 1131

- fast electron radiation, radiation resistance, water air mass stopping power ratio, 3384
- neutron detection, silicon diode, photon, electron response, 3562
- neutron spectrometry, radiation field, thermoluminescence dosimeter, 2279
- radiation depth dose, therapy, computer, 3669
- radiation depth dose, therapy, physical characterization, 597
- radiation detection, roentgen radiation, silicon diode, compensating shield for diode, 2663
- meglumine diatrizoate**, cerebellum vermis, computer assisted tomography, pseudotumor, diagnostic pitfall, 5 cases, 1967
- melanocytoma**, echooculography, exophthalmos, optic nerve coloboma, retinoblastoma, vitreous body hemorrhage, new equipment, manual compound scanning, 1100
- melanodermic leukodystrophy**, brain atrophy, brain scintigraphy, computer assisted tomography, X chromosome recessive inheritance, 2 cases, 3816
- membrane**, cell membrane, ion transport, mathematic model, osmotic pressure, thermodynamics, 2437
 - cell membrane, ion transport, mathematic model, osmotic pressure, thermodynamics, 2436
 - cell membrane conductance, mathematic model, noise, 2409
 - cell transport, permeation time, diffusion equation, 1256
 - dielectric constant, lipid membrane, theoretical calculation, bilayer membrane, 91
 - mathematic model, membrane permeability, jump and electro diffusion description, 389
 - membrane potential, voltage clamp, non uniform membrane, 482
 - thermodynamics, 2430
- membrane capacitance**, cell, drug, iontophoresis, time course, 483
 - gating circuit, gating current, 494
 - hexadecane, lipid, protein, bilayer membrane, membrane physical chemistry, 3629
 - lipid membrane, electrocompression, squid, 2471
- membrane impedance**, excitable membrane, hodgkin huxley equation, impedance, 2839
- membrane model**, mathematic model, goldman hodgkin katz equation, 74
- membrane oxygenator**, SEE oxygenator
- membrane permeability**, alamethicin, autocorrelation, lipid membrane, membrane potential, power, multi pore system, autocorrelation analysis, power spectral density, 3549
 - calcium hydroxide, membrane potential, konjak membrane, 2388
 - cholinergic system, potassium channel, no constant field, 935
 - electron transport, ion transport, membrane potential, 392
 - excitable membrane, lipid membrane, nerve fiber membrane, potassium, sodium, didactic presentation, 397
 - ion transport, noise, theoretical study, 2390
 - ion transport, parameter calculation, 2772
 - lipid membrane, mitochondria membrane, ultraviolet radiation, 1625
 - mathematic model, membrane, jump and electro diffusion description, 389
 - membrane steady potential, porous membrane, 1322
 - membrane vesicle, light scattering measurement, 10
 - comprehensive parameters, 51
- membrane potential**, alamethicin, lipid membrane, voltage clamp, multipore system, multi pore system, voltage jump current relaxation measurement, 3174
 - alamethicin, autocorrelation, lipid membrane, membrane permeability, power, multi pore system, autocorrelation analysis, power spectral density, 3549
 - ammonium, sodium chloride, voltage clamp, electric resonance, 1720
 - anisotropy, heart muscle membrane potential, mathematic model, muscle, nerve, syncytium, dog, 3184
 - calcium hydroxide, membrane permeability, konjak membrane, 2388
 - beta carotene, cellulose derivative, lecithin, photostimulation, retinal isomer, 3156
 - cell membrane, constant current stimulator, electrostimulator, nervous system, current rectification, resistance measurement, 1491
 - cell membrane conductance, phospholipid membrane, sarcoplasmic reticulum, 3501
 - contact, lipid membrane, contact force, 3555
 - electron transport, ion transport, membrane permeability, 392
 - embryo, heart muscle fiber, microelectrode, signal noise ratio, intercellular communication, 1742
 - ethylene glycol, lipid membrane, bilayer membrane, 3177
 - excitable membrane, lipid membrane, nerve fiber membrane, 394
 - gating circuit, lipid membrane, bilayer membrane, 869
 - lipid membrane, nerve fiber membrane, non linear electric affects, 1736
 - lipid membrane, tetraphenylborate sodium, voltage clamp, bilayer membrane, 3173
 - lipid membrane, tetraphenylborate sodium, electrostatic interaction, 2472
 - mathematic model, voltage clamp, jump and continuous description, 481
 - mathematic model, ac properties, bipolar membrane, 1324
 - mathematic model, nonlinear system, spike, finite cable model, cable model, 1312
 - membrane, voltage clamp, non uniform membrane, 482

membrane protein, calcium adenosine triphosphatase, cell membrane, lipid membrane, rhodopsin, 404

membrane steady potential, lecithin, lipid membrane, monazomycin, nonactin, phosphatidylethanolamine, phospholipid, valinomycin, antibiotic membrane probe, 1247

- membrane permeability, porous membrane, 1322

membrane vesicle, membrane permeability, light scattering measurement, 10

memory, adenosine triphosphatase, amnesia, cycloheximide, lithium chloride, ouabain, phenytoin, potassium chloride, protein synthesis, sodium pump, 3 phase model, 241

- auditory system, melody, tonal sequences, model, 1281
- behavior, model, picturephone, 2975
- brain, mathematic model, nerve cell network, associative memory, 3187
- cerebellum cortex, music, nerve cell network, pattern recognition, purkinje cell, d neuronal network, 1732
- crystal, life, definition, crystalline physiology, 2969
- cybernetics, feedback system, philosophy, 2007
- holography, associative memory chains, 1881
- learning, mathematic model, nerve cell network, pattern recognition, potassium channel, sodium channel, synapse, 1316
- mathematic model, nerve cell potential, synapse, memory storage capacity, 3181
- mathematic model, neurotransmitter, synapse transmission, non linear model, 2235
- model, recognition, multiple observation model, 2006

menarche, age, breast cancer, cancer incidence, cancerogenesis, epidemiology, menopause, stochastic model, 2768

meniere disease, acoustic nerve neurinoma, cochleography, differential diagnosis, 439 cases, 3337

- audiometry, auditory masking, cochleography, evoked acoustic nerve response, sudden deafness, tuning curve, 2443

meningioma, astrocytoma, brain tumor, central nervous system metastasis, computer assisted tomography, craniopharyngioma, hypophysis adenoma, 1658 cases, 817

- brain abscess, brain scintigraphy, brain tumor, computer assisted tomography, posterior fossa, subdural hematoma, review, 1194
- brain contusion, cerebrovascular disease, computer assisted tomography, glioblastoma, hydrocephalus, 1215
- brain tomography, computer assisted tomography, optic nerve, visual field defect, woman of 44, 1586
- brain tumor, computer assisted tomography, diatrizoate, glioma, hypophysis adenoma, non contrast scanning, 299 cases, 3457
- computer assisted tomography, exophthalmos, hemangioma, myositis, tumorous and nontumorous exophthalmos, 90 cases, 802

meningitis, brain abscess, brain hemorrhage, brain infarction, brain tumor, computer assisted tomography, encephalitis, 80 children, 3462

- computer assisted diagnosis, diagnosis, differential diagnosis, statistical diagnosis, clinical diagnosis, 1565
- decision theory, diagnosis, mathematic model, 248

meningomyelocele, handicapped child, mobility, orthotics, standing, 3002

meningorrhagia, brain hemorrhage, computer assisted tomography, head trauma, 1173

meninx, brain cortex, electrocorticography, electroencephalography, mathematic model, source tangential layer, 492

- electrode, electroencephalography, mathematic model, scalp, 2469
- electroencephalography, multilayer flat cable, 2461

menopause, age, breast cancer, cancer incidence, cancerogenesis, epidemiology, menarche, stochastic model, 2768

mental deficiency, brain hematoma, brain tumor, computer assisted tomography, headache, head trauma, hydrocephalus, seizure, 795

- physical disability, wheelchair, prescription, 286

mental disease, hospital, maladjustment, medical record, neuroleptic agent, schizophrenia, adolescent, 2369

mental health, computer, missouri actuarial report system, 3484

mental hospital, hospital personnel, medical record, training, problem oriented record, 2370

- intensive care, teaching, closed circuit television, 3723

mental load, anesthetist, heart rate, hospital personnel, operating room, stress, telemetry, 525

mercurous chloride, brain cortex steady potential, electrode, spreading cortical depression, rat, 2230

metabolism, cell growth, cell population, circadian rhythm, glycolysis, 2792

- mathematic model, metabolism analysis, 421

metacarpophalangeal joint, biomechanics, hand, 2027

metal, ceramics, hip prosthesis, total hip prosthesis, 30 patients, 278

- etching agent, microelectrode, electronic control, 996

metal prosthesis, endoprosthesis, temperature, ultrasonics, rabbit, 191

metaphase, chromosome analysis, computer, karyotype, lymphocyte, microscopy, automatic metaphase finding, 1563

- metastasis**, abdominal wall, computer assisted tomography, radiotherapy, uterine cervix carcinoma, case report, 3812
- brain edema, brain hernia, brain tumor, computer assisted tomography, ascending transtentorial herniation, 7 cases, 3837
 - cell adhesion, cell contact inhibition, cell fusion, mathematic model, van der waals force, 1263
- methacrylic acid**, bone cement, gas chromatography, spectrophotometry, residue determination, 1623
- methacrylic acid methyl ester**, SEE methacrylic acid methyl ester
- methacrylic acid methyl ester**, bone cement, endoprosthesis, joint capsule, joint total replacement, macrophage, wear product reaction, 1110
- bone cement, fracture external fixation, 3359
 - femur greater trochanter, osteotomy, total hip prosthesis, surgical technique, carbide drills, prosthesis extraction, 2383
- methane**, interferometry, design, 2553
- methotrexate**, cancer, computer program, drug half life, folinate calcium, kidney failure, mathematic model, pharmacokinetics, 5 patients, 3435
- cancer chemotherapy, computer, decision, 100 patients, 3053
 - computer assisted tomography, leukoencephalopathy, myeloid leukemia, necrotic leukoencephalopathy, computed tomography, woman of 39, female 39 yrs, clinical course, 371
- methyladenine**, caffeine, calcium, cell membrane, egg, oogenesis, theobromine, theophylline, hormone surface interaction, scanning electron microscopy, starfish, 3716
- methylene diphosphonate technetium tc 99m**, bone scintigraphy, computer, technetium pyrophosphate tc 99m, computer assisted comparison of bone imaging, 350 patients, 2717
- methylpheophorbide a**, chlorophyll, laser, photosynthesis, pheophetin a, 167
- metrizamide**, acoustic nerve neurinoma, cisternography, computer assisted tomography, neurinoma, pons angle tumor, 10 cases, 3841
- arnold chiari malformation, computer assisted tomography, myelography, syringomyelia, 20 cases, 3765
 - brain arachnoid cyst, brain cyst, cerebrospinal fluid, cisternography, computer assisted tomography, 4 cases, 3441
 - brain tumor, cisternography, computer assisted tomography, suprasellar mass, 10 cases, 1589
 - cerebrospinal fluid flow, cisternography, computer assisted tomography, 25 cases, 812
 - computer assisted tomography, spinal cord disease, syringomyelia, tumor, vertebral canal stenosis, 3 cases, 2357
- mica**, ultraviolet radiation, vacuum, window, mica window, optic cell, 1412
- microaggregate**, blood filter, blood transfusion, effectiveness, review, 213
- microcirculation**, SEE capillary flow
- microcomputer**, calculator, histogram, nerve cell potential, 2234
- clinical laboratory, information processing, distributed processing, 2304
 - computer, monitoring, unibed system, 2328
 - digital computer, microprocessor, applicability, 1791
- microdensitometry**, densitometry, modulation transfer function, temporal response, 3023
- microelectrode**, action potential, histogram, window discriminator, time amplitude discriminator, 2238
- alcian blue, nerve cell, electrode tip labelling, cat, 1886
 - amplifier, high impedance amplifier, input capacitance neutralization, 1759
 - antimony, bicarbonate, buffer, carbon dioxide, carbon dioxide tension, hydrogen ion, oxygen tension, antimony microelectrode, 165
 - brain blood flow, brain cortex, nerve cell, technique of recording, cat, hydrogen clearance method, 1085
 - brain depth recording, nerve cell potential, floating mobile electrode, frog, 246
 - brain depth recording, cerebellum, stereotaxic implantation, awake, cat, 1075
 - calcium electrode, chloride electrode, ion exchange, magnesium electrode, potassium electrode, physicochemistry, 1343
 - capillary, fiberglass, micropipette, fiberglass filament introducing, 501
 - carbon dioxide electrode, monitoring, in vivo measurement, 3634
 - cell membrane, resistance, tip geometry, 1808
 - cell membrane potential, glass electrode, kidney slice, sweat gland, self filling, semifloating, rat, 1805
 - computer, dorsal root potential, nerve cell potential, spinal cord posterior horn, substantia gelatinosa, very small neuron, activity isolation method, mouse, 1238
 - electrode, glass electrode, stereotaxic surgery, filling procedure, 1888
 - electroencephalography, electroretinography, nerve cell potential, oxygen electrode, platinum electrode, double barrelled electrode, simultaneous measurement, 2142
 - embryo, heart muscle fiber, membrane potential, signal noise ratio, intercellular communication, 1742
 - etching agent, metal, electronic control, 996
 - frequency modulation, nerve cell potential, telemetry, compact miniature system, rat, rabbit, 2619
 - glass electrode, multibarrelled electrode, blank preparation, 3237
 - insulator, parylene, 1501

- intracellular potential, mast cell, peritoneum macrophage, measurement techniques, mouse, 159
- laser, nerve cell potential, multi microelectrode array, microelectrode processing, 2547
- micropipette, micropipette beveling, ceric oxide, intracellular recording, 103
- micropipette, electrode filling, 944
- muscle fiber, ph electrode, soleus muscle, mouse, 1005
- nerve cell potential, recording method, active rat, 2623
- nerve cell potential, nerve fiber potential, signal noise ratio, chronic recording, tube electrodes, 559
- spinal cord motoneuron, voltage clamping, current clamping, circuit development, cat, 2546
- tungsten, microelectrode tip, oxyacetylene torch flame, tip in 5 sec, 998
- microelectrophoresis**, electric field, electrophoresis, alternating field, 609
- microfilm**, medical record, patient care, 340
 - radiography, 355
- microfilter**, blood, emergency, lung blood flow, lung insufficiency, filtration rationale, 3280
- microiontophoresis**, artifact reduction, nerve cell potential, raphe nucleus, stimulation artifact, technique, 1806
- microlaryngoscopy**, loupe, new binocular loupe, 2949
- micromanipulator**, nerve cell potential, cat, 1502
- micrometer**, artery, ultrasonics, artery diameter, transit time system, 2166
- microphone**, auditory stress, ear trauma, environment, hearing, sound level measurement, conga microphone, 1019
 - fiberoscope, ultrasonics, 2574
 - heart sound, phonocardiography, signal noise ratio, 1058
 - laser, ultrasonics, non linear acoustics, 601
 - mathematic model, probe tube microphone, 195
 - mathematic model, signal noise ratio, microphone array, 194
 - calibration, dumiload, 192
- microphotography**, experimental animal, microsurgery, surgical microscope, vascular surgery, 2 separately operated microscopes, foot pedal operated zoom, human surgery, adaptation possible, 327
- microphotometry**, electron microscopy, freeze etching, microscope slide, 3223
- micropipette**, blood pressure meter, pipet, 1472
 - blood rheology, erythrocyte deformability, electronic flow measurement, tube flow, 472
 - brain depth recording, hypothalamus, recording barrel, method description, guinea pig, 3268
 - capillary, fiberglass, microelectrode, fiberglass filament introducing, 501
 - cell fluid, conductivity, resistance, indirect measurement, 1809
 - etching agent, glass electrode, hydrofluoric acid, tip etching, 2539
 - microelectrode, micropipette beveling, ceric oxide, intracellular recording, 103
 - microelectrode, electrode filling, 944
- microprocessor**, ad converter, automation, information processing, laboratory, multiplexer, modules marketing, 2519
 - algorithm, computer program, laboratory automation, process control, 2692
 - anesthesia, computer, electroencephalography, frequency analyzer, hypoxia, minicomputer, monitoring, display system, cerebral function analyzer monitor, 3805
 - apnea, bradycardia, monitoring, infant, 2715
 - arm prosthesis, blood pressure, digital computer, electroencephalography, heart catheterization, monitoring, prosthesis, 2685
 - computer program, 1795
 - computer program, information processing, medical record, mumps, 3044
 - cytophotometer, digital computer, system controller, 2508
 - data reduction, data transmission, electrocardiography, information processing, telemetry, 1944
 - digital computer, basic principle, 989
 - digital computer, process control, 988
 - digital computer, 140
 - digital computer, small scale system, 2522
 - digital computer, multi-microprocessor system, 2521
 - digital computer, multi microprocessor system, 2520
 - digital computer, medical engineering, instrumentation, application, 2483
 - digital computer, architecture, 2124
 - digital computer, evaluation, 2123
 - digital computer, image processing, array processor, 1793
 - digital computer, microcomputer, applicability, 1791
 - electronystagmography, optokinetic nystagmus, vestibular nystagmus, 2000
 - fetus heart rate, heart rate, information processing, labor, 1865
 - image processing, review, 1931
 - information processing, moessbauer spectrometer, 3673
 - information processing, signal processing, differential equation, 2879

- power control, power supply, thyristor, digital control, 2491
- telemetry, telecommunication, 2880
- marketing, 2523
- microscope illumination**, laser, 514 nm wave length, 568
- microscope slide**, electron microscopy, freeze drying, critical point drying, 3224
 - electron microscopy, freeze etching, microphotometry, 3223
- microscopy**, atherosclerosis, capillary flow, diabetes mellitus, hypertension, skin capillary, television, vital television capillary microscopy, 3285
 - bone marrow cell, cell, cross correlation, multispectral cell image, 2307
 - cell, cell size, circumfusion chamber, micrometry, living single cells, 569
 - cell diameter, erythrocyte, laser, light diffraction, 2182
 - chromosome analysis, computer, karyotype, lymphocyte, metaphase, automatic metaphase finding, 1563
 - computer, histopathology, optical marker, microscopy data, quantitative analysis, 983
 - cornea endothelium, 2631
 - cryogenics, sample holder, 2507
 - eye surgery, illumination, stereoscopic vision, new instrument, 3038
 - eye surgery, microsurgery, sterility, 2098
 - fourier transform, image processing, pattern recognition, mellin transfer, 1008
 - image processing, contrast microscope, 1363
 - image processing, laser, scanning microscopy, 2505
 - image processing, scanning microscopy, 1785
 - positioning device, spectrometry, television camera, ccd, 2541
 - radiation hazard, ultrasonics, 299
 - resolving power, ultrasonic microscope, ultrasonics, 2870
 - resolving power, annular aperture, 1780
 - sample holder, specimen stretcher, 537
 - scanning microscopy, 2148
 - nondestructive, 3641
- microspectrophotometry**, cancer cytodiagnosis, computer, uterine cervix carcinoma, uterine cervix cytology, cytologic automation, papanicolaou staining, 109 free lying cells, 332
- microsphere ce 141**, arteriovenous shunt, blood flow, heart muscle blood flow, heart output, indocyanine green, microsphere sr 85, turkey, dog, 1474
- microsphere sr 85**, arteriovenous shunt, blood flow, heart muscle blood flow, heart output, indocyanine green, microsphere ce 141, turkey, dog, 1474
- microsurgery**, astigmatism, cataract extraction, cornea curvature, cornea transplantation, keratometer, troutman type, 1517
 - experimental animal, microphotography, surgical microscope, vascular surgery, 2 separately operated microscopes, foot pedal operated zoom, human surgery, adaptation possible, 327
 - eye surgery, loupe, low vision, prism, visual aid, new device, 2295
 - eye surgery, head rest, new device, 3354
 - eye surgery, microscopy, sterility, 2098
 - eye surgery, television, ceiling mounted unit, 3400
- microwave generator**, resonance, electron wave interaction, 3658
- microwave radiation**, air pollution, spectrometry, stark spectrometer, 3661
 - air pollution, atmosphere, environment, sulfur dioxide, 1873
 - amplifier, cryogenics, fet semiconductor, signal noise ratio, 107
 - antenna, radiation hazard, avoidance, 1011
 - antenna, brain depth stimulation, chemotherapy, radiation hazard, stereotaxis, 2172
 - artificial heart pacemaker, radar, 16 pacemakers, susceptibility, 218
 - body temperature, calorimetry, heat clearance, radiation hazard, mice, 2433
 - body temperature, dopamine, electric field, hyperthermia, hypothalamus, noradrenalin, serotonin, rat, 2579
 - brain, head, radiation hazard, cross polarized wave, mammal, 583
 - brain, enzyme, homoprotocatechuic acid, radiation hazard, rat, 3628
 - cell membrane, electromagnetic radiation, thermodynamics, non thermal effects, 1833
 - corn, environment, germination, 2152
 - cryogenics, paramagnetic resonance, microwave coupler, 186
 - diagnosis, lung edema, 656
 - diathermy, electromagnetic field, electromagnetic radiation, hyperthermia, physiotherapy, 2178
 - dielectric constant, electromagnetic radiation, 1810
 - dielectric constant, dielectric lens, 585
 - dielectric constant, muscle, tissue water, rotational water mobility, 184
 - electromagnetic radiation, heating, thyroid gland, thyroxine, triiodothyroxine, dog, 2566
 - electromagnetic radiation, industrial medicine, occupational health, radiation hazard, 3659
 - electromagnetic radiation, neurotransmitter, receiver, telemetry, 183

- environment, occupational health, radar, radiation hazard, radiation sources, 3660
- fourier transform, spectrometry, 3663
- head, radiation absorption, thermography, man, monkey, 1819
- hearing, 2043
- image processing, millimeter wave, 1012
- image processing, lung, respiration, 2286
- impedance, liquids, 2138
- implant, plexiglass, radiation hazard, 580
- liquid crystal, radiation detection, radiation hazard, 2151
- lung edema, monitoring, diagnosis, 1064
- nuclear magnetic resonance, signal detection, slotted resonator, 1417
- power amplifier, semiconductor, 108
- radiation hazard, restraining device, monkey, 1438
- shield, 2565
- 3246
- 3662
- micturition**, auscultation, sound, registration of sound micturition, 1876
 - bladder, bladder pacemaker, electrode, implant, paraplegia, quadriplegia, spinal cord injury, urethra, baboon, 1486
 - bladder pressure, urethra pressure, experimental model, 2616
- middle ear**, electrostimulation, reflex time, tensor tympani muscle, tongue, bipolar electric stimulation, device, 1506
- migration**, diffusion, ecology, equation, nonlinear system, population model, differential equation, multispecies model, stability, 876
 - gene frequency, inheritance, mutation, population model, statistics, stochastic model, island model, 2788
 - magnetic field, vision, bird, 166
- migration inhibition**, cellular immunity, dose response, mathematic model, migration assay, 19
- milwaukee brace**, scoliosis, treatment, 1900
- minicomputer**, administration, finance, patient care, medium scale computer converting to mini, 2875
 - anesthesia, computer, electroencephalography, frequency analyzer, hypoxia, microprocessor, monitoring, display system, cerebral function analyzer monitor, 3805
 - angiocardiology, artificial heart pacemaker, data base, decision, 3095
 - aqueous humor, intraocular pressure, ophthalmology, xenon 133, pdp 8 e, cat, 3481
 - computer, electroencephalography, automation, stationary point detection, 3055
 - computer memory, image processing, television camera, 2514
 - computer program, digital computer, information processing, lateral geniculate body, probability, spike, statistics, cat, 1617
 - densitometry, image processing, television, 124
 - digital computer, image processing, image restoration, one line computation, 1369
 - digital computer, one board computer, 142
 - digital computer, process control, 2122
 - digital computer, oscilloscope, signal processing, 3228
 - electromyography, muscle isometric contraction, spike, 1954
 - electrostimulation, neuromuscular disease, orthosis, peroneus nerve paralysis, design methodology, 1239
 - pneumography, spirometry, impedance pneumograph, microprocessor, 1616
 - select, narrative text generation, 1370
- minimum erythema dose**, erythema, erythropoietic porphyria, light reactivity, photochemotherapy, phototest, ultraviolet radiation, new apparatus, application, 3651
- miosis**, computer assisted tomography, gaze paralysis, hemiplegia, thalamus hemorrhage, 18 cases, 814
- mirror**, collimator, solar energy, 3244
 - heater, wall mounted mirror warmer, 3207
- mitochondria**, axoplasm flow, computer, spinal cord, tissue culture, mouse, 2372
 - benzimidazole derivative, cell membrane, mathematic model, oxidative phosphorylation, in vitro, model study, 2764
 - cell division, growth, mathematic model, 1635
- mitochondria membrane**, lipid membrane, membrane permeability, ultraviolet radiation, 1625
- mitosis**, automation, chromosome analysis, computer analysis, histogram, automated classification, 2300
 - cell, cell population, mathematic model, autooscillation delay, 391
 - cell population, mathematic model, self oscillation, density control, 2008
- mitral valve**, cardiology, echocardiography, echography, mitral valve stenosis, 20 normals, 718
 - chorda tendinea, elasticity, dynamic elasticity, human tendineae, 1663
 - turbulent flow, human valve, 72
- mitral valve prolapse**, aorta subvalvular stenosis, cardiology, computer, echography, mitral valve stenosis, pattern recognition, 3102

- mitral valve prosthesis**, aorta, aorta valve prosthesis, heart left ventricle, model, flow visualization, 920
 - aorta surgery, aorta valve prosthesis, ascending aorta, blood flow, extracorporeal circulation, flowmetry, 2207
 - echocardiography, mitral valve stenosis, model, ultrasonics, three different mitral valve models, 427
 - echocardiography, phonocardiography, 15 cases, 1434
 - comparison, smeloff cutter prosthesis and toroidal mitral prosthesis, 175 patients, 630
- mitral valve regurgitation**, aorta stenosis, artery wall compliance, hemodynamics, model, hydraulic model, factors affecting transvalvar pressure, gorlin formula, 917
- mitral valve stenosis**, aorta subvalvular stenosis, cardiography, computer, echography, mitral valve prolapse, pattern recognition, 3102
 - cardiography, echocardiography, echography, mitral valve, 20 normals, 718
 - computer, heart catheterization, heart output, heart stroke volume, lung artery pressure, lung blood volume, radiocardiography, mitral valve area, 33 patients, 2754
 - echocardiography, mitral valve prosthesis, model, ultrasonics, three different mitral valve models, 427
- mixing**, diode, receiver, signal noise ratio, telemetry, 119
- mobile emergency life support**, ambulance, army, helicopter, special training, denmark, 606
- mobility**, auditory ossicle, ear drum, electromagnet, objective mobility test, 3353
 - blindness, laser cane, visual aid, electronic aids, sonic guide, children, pathsounder, 1508
 - handicapped child, meningomyelocele, orthotics, standing, 3002
- model**, acceleration, body posture, impact, intervertebral disk, seat, musculoskeletal model, 3138
 - acceleration, human body, vibration, human body, reaction to external forces, 2677
 - acetylcholine, cholic acid, cholinergic receptor, triton x 100, model evaluation, theatrical aspects, 12
 - actin, actomyosin, adenosine triphosphatase, calcium, muscle, myosin, quantitative model, 890
 - actin, adenosine triphosphatase, muscle, myosin, troponin, 48
 - adenosine diphosphate, adenosine triphosphate, muscle contraction, quantum theory, sliding filament theory, transducer, quantum mechanical transducer model, 2033
 - adenosine triphosphate, calcium, cell membrane, cell membrane permeability, sodium, transport mechanism, 2011
 - adenosine triphosphate, muscle contraction, cross bridge model, 3142
 - adrenal gland, chemical kinetics, corticotropin, 2183
 - aircraft, man machine interaction, pilot, 3503
 - airplane pilot, ejection seat, emergency, mathematic model, body model, windblast force, aerodynamic force, articulated human body, emergency ejection, 2648
 - airplane pilot, performance, optimal control pilot vehicle model, roll motion effect, 3367
 - airplane pilot, biodynamics, mathematic model, parachutist, ucin crash victim simulation code, wind loading effect, 3364
 - air pollution, environment, pollution monitoring, 2955
 - airway, lung compliance, lung elasticity, respiration, flow limiting segment, 442
 - anemia, computer assisted diagnosis, computer teaching, hematology, computer vs non computer, france, 2690
 - aneurysm, hemodynamics, fusiform model, 474
 - aneurysm, hemodynamics, 468
 - aorta, aorta valve prosthesis, heart left ventricle, mitral valve prosthesis, flow visualization, 920
 - aorta flow, capillary flow, circulation, vein blood flow, 919
 - aorta stenosis, artery wall compliance, hemodynamics, mitral valve regurgitation, hydraulic model, factors affecting transvalvar pressure, gorlin formula, 917
 - arteriole resistance, kidney concentrating capacity, kidney medulla, nephron, rabbit, central core model, 916
 - artery, blood pressure, heart, dog, least energy, 2832
 - artery, elasticity, mathematic model, hydraulic model, elastic non uniformity, 46
 - artery, artery flow, doppler ultrasound flow meter, femoral artery, information processing, transfer function model, 3543
 - artery murmur, blood flow, phonocardiography, stenosis, 1709
 - artifact, electrocardiography, electroencephalography, skin abrasion, skin dystrophy, skin injury, skin potential, sweating, transcutaneous stimulation, wound healing, 3234
 - artificial heart pacemaker, artificial heart pacemaker failure, model medtronic 5880 a, inhibited by touching metal coverplate, 2937
 - athlete, running, work, negative work, running speed, 6 athletes, 3516
 - auditory masking, basilar membrane, hearing, 457
 - averaging, digital computer, digital filtering, electroencephalography, evoked response, evoked visual response, 3727
 - background radiation, decision, dosimetry, radioactivity, statistics, statistical interpretation of counting data, 306
 - ballistocardiography, cardiovascular system, 216

- basilar membrane, cochlea, hair cell, tuning model comparison, 2822
- basilar membrane, hearing, frequency discrimination, 1287
- behavior, computer model, sexual behavior, newt, 395
- behavior, memory, picturephone, 2975
- biological model, computer model, oxygen transport, 2451
- biology, computer, ecology, mathematic model, algorithm, 1788
- blood, pharmacokinetics, simulation of blood level curves, 411
- blood vessel catheterization, hemodynamics, 638
- blood volume, great vessels transposition, indicator dilution curve, lung blood flow, new technique, 3703
- bone, bone strength, fatigue, stress, bone bending fatigue strength, human, 3139
- bone conduction, mastoid, 3130
- brain lesion, 2811
- breast cancer, chronic disease, mammography, mass screening, periodic medical examination, mathematical analysis, transient analysis, screening interval, 1250
- breathing rate, lung alveolus, lung pressure, mathematic model, 2830
- cable, myelination, nerve fiber, saltatory conduction, test theory, 1727
- capillary flow, heart muscle blood flow, isotope tracing, physiology, theory of tracer washout technique, 2929
- carbon dioxide, respiration control, grodin model, 2827
- car driving, fatigue, stress, real situation simulation, highway driving, 3370
- carotid artery, clostridiopeptidase a, elasticity, hyaluronidase, iodoacetate sodium, noradrenalin, pancreatopeptidase e, sodium cyanide, maxwell model, voigt model, 1656
- cartilage, thorax, finite element analysis, 1671
- cell, cell interaction, cell potential, dielectric constant, 485
- chemical kinetics, poikilothermy, thermodynamics, 208
- compartment model, pharmacokinetics, linear compartment model, micro constant, 410
- compartment model, pharmacokinetics, linear compartment model, 409
- compartment model, pharmacokinetics, linear compartment model, 408
- computer, computer program, emergency ward, information processing, statistics, deterministic simulation model, data reconstruction, 2686
- coronary artery circulation, intramyocardial blood flow, 3168
- cost, epidemiology, immunization, mathematic model, statistics, 3509
- data base, medical record, retrieval system, indexing, 1608
- data base, information processing, medical documentation, postgraduate education, retrieval system, medlars, medline, index medicus, usa, problem oriented medical data, 2751
- decision, mathematic model, survey, model testing, 2765
- defibrillation, mathematic model, skin burn, skin conductance, defibrillator default, human, 450
- earmould, hearing aid, resonance, sound filtering, side branch, parallel vent, acoustical model, electrical model, 3729
- echocardiography, mitral valve prosthesis, mitral valve stenosis, ultrasonics, three different mitral valve models, 427
- echography, ultrasonics, tissue model, liquid mixture with acoustic characteristics, 738
- elasticity, temporomandibular joint, small forcès, model, human, 49
- electric model, epithelium, sodium, sodium pump, 2395
- electroencephalography, epilepsy, excitatory postsynaptic potential, feedback system, filter, inhibitory postsynaptic potential, nerve cell network, neuron population, 3548
- electromagnetic radiation, radiation absorption, induced electromagnetic field, 2275
- environment, noise generator, noise pollution, spectrometry, traffic, 1426
- epidemiology, mortality, population model, statistics, competition, prey predator, 2785
- ergonomics, spine, human spine, torso, head, three-dimensional model, 2425
- excitable membrane, excitation mechanism, 388
- fat, pacemaker nerve cell, potassium channel, semiconductor, tetrodotoxin, 926
- fet semiconductor, nerve cell potential, 1743
- flow, heart valve, heart valve disease, heart valve prosthesis, flow resistance assessor, 1447
- focal point, image quality, magnification radiography, modulation transfer function, 723
- focal point, image quality, magnification radiography, modulation transfer function, 722
- fourier transform, modulation transfer function, tomography, linearding mechanism, 3756
- fracture, fracture external fixation, mechanics of oblique fracture fixation, 887
- head, parametric study, finite element, 1248
- head trauma, primate, 2810
- head trauma, injury, mathematic model, skull fracture, response probability density function technique, 3365
- hearing, nonlinear system, signal processing, residuum, 2818
- heart electric field, isolated rabbit heart, 3551

- heart muscle, sliding filament theory, 2054
- heat loss, respiration, water loss, predictive model, kangaroo rat, 1279
- image production, radiography, statistics, unified view of imaging system, 1923
- injury, thorax, 3307
- intelligence, learning, 11
- ionization chamber, radiography, roentgen radiation, energy dependence, 3665
- laminar air flow, radioisotope, flow measurement methods, 1377
- lung alveolus surfactant, in vitro, physics, 2816
- mathematic model, muscle contraction, kinetics, 2801
- mathematic model, modulator, sinus node, pulse frequency modulator, 3183
- mathematics, population dynamics, statistics, whale, 9
- memory, recognition, multiple observation model, 2006
- movement perception, visual memory, forward inhibition, 1636
- movement perception, vision, detection model, 2048
- muscle contraction, quantum mechanics, sliding filament theory, quantum mechanical formation, 2419
- muscle contraction, protein switch, catastrophe model, 2806
- nerve cell, photoreceptor, postsynaptic receptor, presynaptic receptor, retina, synapse transmission, 2844
- optokinetic nystagmus, vestibular nucleus, vestibular nystagmus, 2036
- osteosynthesis, evaluation, fixation plate, finite element, 1265
- pattern recognition, vision, visual acuity, 2049
- pharmacokinetics, 407
- pupil reflex, reflection, 460
- scintillation camera, window, effect window fraction, deadtime correction, 1424
- skin conductance, square wave stimulator, stimulation, transcutaneous stimulation, 2549
- skull, cupola with a flat base, 428
- statistics, variance analysis, 2775
- vibration, human response modelling, biodynamic measurements, 2428
- evolution, 2024
- modulation**, hearing, intermodulation, 2444
- modulation transfer function**, camera, mathematic model, scintigraphy, scintillation, statistics, 1921
 - camera, lens, zoom lens, 3590
 - computer assisted tomography, fourier transform, 3 d image, 1978
 - computer assisted tomography, emi head scanner, 3460
 - computer assisted tomography, emi scanner, 768
 - computer assisted tomography, computer program, scintillation camera, tomoscintigraphy, evaluation of depth effect, 2347
 - densitometry, microdensitometry, temporal response, 3023
 - fluoroscopy, radiography, 1928
 - fluoroscopy, fourier transform, image processing, mottle analysis, intensifying screen, power spectrum, 498
 - focal point, roentgen radiation, 93
 - focal point, image quality, magnification radiography, 724
 - focal point, image quality, magnification radiography, model, 723
 - focal point, image quality, magnification radiography, model, 722
 - fourier transform, model, tomography, linearding mechanism, 3756
 - image intensifier, radiography, tube lens, 2285
 - image intensifier, resolution, microchannel plate image intensifier, 3022
 - image quality, tomography, 2310
 - tomography, blurring effect, 1755
 - xeroradiography, 3227
 - calculation from edge response function, 3386
 - truncated sinusoidal test, 2554
- modulator**, mathematic model, model, sinus node, pulse frequency modulator, 3183
- moessbauer spectrometer**, information processing, microprocessor, 3673
 - velocity drive, 3672
- molecular biology**, nerve fiber membrane, nerve potential, thermodynamics, squid, rabbit, 1677
- molecular structure**, calcium, nerve fiber membrane, sodium conductance, squid, 3552
 - chemical kinetics, computer model, nutrition, chemoton, 610
 - computer program, digital computer, display system, mathematic model, pdp 10, 420
 - frequency modulation, laser, spectrometry, derivative spectroscopy, 2146
 - macromolecule, mathematic model, ligand interaction, 2401
 - mathematic model, mutation rate, 422
 - photometry, spectrometry, oscillator strength, double beam monochromator, 170
 - thermodynamics, ising chain, 2432
- molecular weight**, extrapolation method, sedimentation time, 2435

molecule, computer model, space filling, 401
nolybdenum 99, generator, technetium 99m, multifold generator, testing, 98
nonazomycin, lecithin, lipid membrane, membrane steady potential, nonactin, phosphatidylethanolamine, phospholipid, valinomycin, antibiotic membrane probe, 1247
monitoring, air flowmeter, artificial ventilation, turbulent flow, 655
 - air pollution, environment, laser, digital system, 1480
 - alarm monitoring, artificial ventilation, respiration, device, 2606
 - alternating current, electrocardiography, interference, interference suppression, removal of ac current interference, 2133
 - anesthesia, computer, electroencephalography, frequency analyzer, hypoxia, microprocessor, minicomputer, display system, cerebral function analyzer monitor, 3805
 - anesthesia, nitrous oxide, oxygen consumption, surgery, oxygen measurement, 1934
 - anesthesia, cost, heart arrest, lung function, medical record, operating room, techniques, requirement, 3032
 - anesthesia, brain, electroencephalography, intensive care, 2676
 - anesthetic agent, blood chemistry, blood pressure, computer, electroencephalography, open heart surgery, temperature, patient monitoring system, 350
 - apnea, bradycardia, microprocessor, infant, 2715
 - arm prosthesis, blood pressure, digital computer, electroencephalography, heart catheterization, microprocessor, prosthesis, 2685
 - arterial oxygen tension, multi sensor support, 2139
 - arterial oxygen tension, newborn, oxygen tension electrode, skin oxygen tension, 3633
 - artery, artery pulse, photoelectric plethysmography, reflection photoplethysmography, 1446
 - artificial heart pacemaker, electrocardiography, frequency modulation, telemetry, telephone telemetry, 2678
 - assisted circulation, coronary care unit, electrocardiography, fluoroscopy, hemodynamics, 3353 patients, 30 bed coronary care unit, 217
 - averaging, digital computer, electrocardiography, vectorcardiography, 344
 - balneotherapy, electrocardiography, telemetry, 969
 - bed, body posture, electrocardiography, false alarm by body position in bed, 227
 - blood pressure, central venous pressure, computer, electrocardiography, electroencephalography, 781
 - blood pressure, exercise, sphygmomanometry, semiautomatic monitoring, electronic sphygmomanometer, 2186
 - body temperature, transcutaneous measurement, 3683
 - burn, electrocardiography, electrode, operating room, 3033
 - capnography, end tidal carbon dioxide tension, 3396
 - carbon dioxide electrode, microelectrode, in vivo measurement, 3634
 - cardiography, echography, electrocardiography, fetus heart rate, heart rate, siemens partecust, 325
 - circulation model, mathematic model, systolic blood pressure, elastic reservoir, 1701
 - computer, electromyography, 711
 - computer, microcomputer, unibed system, 2328
 - computer, glucose regulation, in dogs, 1230
 - computer, cost, electrocardiography, physician, safety, over and underutilization, contribution to diagnosis, task force, 2701
 - computer, electrocardiography, medical record, 24 hr monitoring, 343
 - computer, heart arrhythmia, heart ventricle extrasystole, 18 cases, 3056
 - computer, electrocardiography, heart arrhythmia, 3054
 - computer, computer program, 2714
 - computer, heart surgery, infusion, intensive care, postoperative care, alabama, 2712
 - computer, heart output, intensive care, 2711
 - computer, trend, 1170
 - computer, end tidal carbon dioxide tension, functional residual capacity, intensive care, lung function test, mass spectrometry, 2675
 - coronary care unit, heart arrhythmia, nurse, decentralized electrocardiographic display, 2290
 - coronary care unit, digital computer, electrocardiography, 771
 - digital indicator, newborn, vibration, rat, 1551
 - disaster, stethoscope, trauma, war, 1141
 - doppler ultrasound flow meter, fetus heart rate, new technique, 1552
 - dye dilution curve, heart output, open heart surgery, thermodilution, 633
 - ectopic beat, electrocardiography, heart arrhythmia, outpatient, 2294
 - electric accident, hospital, 100
 - electric accident, review, 1550
 - electric accident, electrocardiography, medical engineering, 748
 - electric accident, electrocardiography, 1139
 - electric accident, electric device, hospital, medical engineering, power supply, electrical plug, safety

- precaution, 1138
- electric interference, electrophysiology, 2964
- electrocardiography, electrode, heart catheterization, chest lead, radiotransparent electrode, 1548
- electrocardiography, heart left ventricle ejection time, heart systolic time interval, ambulatory interval monitoring, 2194
- electroencephalography, signal processing, surgery, 1140
- electromagnetic radiation, intracranial pressure, telemetry, temperature, 1361
- fiberoscope, head trauma, intracranial pressure, pressure transducer, 46 cases, 2231
- heart left atrium pressure, heart surgery, postoperative care, transseptal monitoring, 3299
- heart rate, digital instrument, 3034
- infection, pressure transducer, infection control design, 150
- integrated circuit, multichannel recorder, telemetry, 970
- integrator, steam sterilization, temperature, 199
- intracranial pressure, pressure transducer, 1758
- intracranial pressure, pressure transducer, telemetry, rotterdam epidural teletransducer, 2493
- intracranial pressure, telemetry, device, 2492
- lung edema, microwave radiation, diagnosis, 1064
- motor activity, obesity, small animals, mouse, 676
- muscle relaxation, nerve block, nerve stimulation, 3329
- operating room, telemetry, 4 channels, 750
- radiotherapy, television, closed circuit television, problematic patient, 3768
- respiration, megamed 05.2.2.d, 2610
- spine, stress, telemetry, radioendosonde, 2105
- monitory**, computer, heart rate, on line statistical analysis, 2713
 - electrocardiography, pulse, skin conductance, transducer, volume, multifunction transducer, 1142
 - intracranial pressure, statistical analysis, automation, aspic system, 2233
- monochromatic light**, eye fundus, eye photography, ophthalmoscopy, normal fundus, 2635
- monochromator**, beta radiation, 593
 - hydrogen discharge, lamp, vacuum, 1817
 - laser, ultraviolet radiation, 2145
- monocyte**, automation, cell identification, spectral characteristics, automation, 333
- mononuclear granulocyte**, cellular immunity, corona virus, immune deficiency, mouse hepatitis virus, spleen cell transplantation, thymectomy, T lymphocyte, virus infection, 3402
- monosynaptic pathway**, nerve cell network, system analysis, 1731
- morphometrics**, computer, myelin, nerve cell, rat, 2303
- mortality**, s (2 aminoethyl) isothiuronium, lifespan, radiation dose fractionation, whole body radiation, mouse, 2903
 - birth rate, population model, 1258
 - computer, mathematic model, multiple trauma, trauma, trauma indices, predictions, 425
 - epidemiology, model, population model, statistics, competition, prey predator, 2785
- mossy fiber**, cerebellum cortex, mathematic model, temporal behavior, turtle, 2087
- mother**, carbon monoxide, carboxyhemoglobin, fetus, mathematic model, uptake and elimination, sleep, 464
- motion picture**, image processing, scintiscanning, film choice, 2571
- motivation**, athlete, personality, psychology, sport, rating scale, coaching, 3474
 - behavior, decision, mathematic model, nerve cell network, statistics, stimulus, behavioral mode selection, 399
 - computer model, digital computer, sexual behavior, male rat, 2393
- motoneuron**, locomotion, mathematics, 1274
- motoneuron disease**, alcoholism, amyotrophic lateral sclerosis, anterior tibial muscle, biceps brachii muscle, electromyography, muscular dystrophy, polyneuropathy, muaps, automatic analysis, 14 controls, 11 cases, 857
 - denervation, electromyography, neuropathy, automatic analysis, 1955
- motor activity**, camera, x,y coordinate recording, 957
 - computer, recording device, 3478
 - monitoring, obesity, small animals, mouse, 676
 - movement, measurement device, rotarod, mouse, 712
- motor cortex**, brain hypothermia, cerebellum, cooling probe, coding device, 3524
- motorized transport**, computer program, statistics, stochastic model, traffic, vehicle degradation, safety inspection, 1630
- motor nerve**, latent period, nerve conduction, signal processing, transfer, 1751
 - nerve conduction, prototype device, 3324
- motor unit**, computer, electromyography, muscle disease, neuropathy, spike, computer analysis, 26 subjects, 75 muscles, human, 1953
 - energy transfer, mathematic model, neuromuscular system, energy optimal control, 1722

- hand dorsal interosseus muscle, mathematic model, muscle isometric contraction, human, 929
- mathematic model, muscle contraction, cybernetic control model, 2813
- mathematic model, muscle contraction, muscle isometric contraction, recruitment, rate coding, 1661
- motor unit potential**, computer, electromyography, tibialis anterior muscle, 4 subjects, automatic analysis, computer, 3427
 - electromyography, frequency analysis, spike, firing time statistics, spectral analysis, 2077
- mouse**, contamination, laminar air flow, staphylococcus aureus, staphylococcus epidermidis, streptococcus, defined flora, husbandry, 3205
 - grip strength, muscle strength, rat, recording device, 3361
- mouse hepatitis virus**, cellular immunity, corona virus, immune deficiency, mononuclear granulocyte, spleen cell transplantation, thymectomy, T lymphocyte, virus infection, 3402
- mouse strain**, autopsy, cancerogenesis, cancer research, computer, data base, organ, pathology, national center for toxicological research, usa, automated pathology information system, 1158
- mouth**, air flow, pneumotachygraphy, speech, measurement of airflow, 654
- mouth surgery**, cryogenics, dentistry, orthopedic surgery, instrument, 328
- movement**, artifact reduction, electrocardiography, electroencephalography, skin abrasion, skin electrode, 1389
 - body, angular moment determination, 1657
 - cerebral palsy, electrostimulation, hemiplegia, orthosis, paralysis, actual situation, problem, 713
 - coordination, electromyography, joint, locomotion, mathematic model, human, 432
 - display system, electrocardiography, telemetry, television, 1354
 - electroencephalography, joint, mathematic model, walking, automatic calculation method, human, 445
 - electromyography, gait, telemetry, volunteer, 1769
 - excitation, nerve fiber potential, 490
 - feedback system, mathematic model, muscle contraction, muscle tone, human arm model, 3523
 - gait, locomotion, derivative determining technique, 1997
 - jaw, lip, television, 1031
 - joint, speech, vocal system, 1867
 - levodopa, task performance, tremor, tracking task, portable instrument, 1880
 - locomotion, manipulation, mathematic model, process control, 2796
 - mathematic model, muscle contraction, voluntary movement, optimal voluntary control, 1659
 - motor activity, measurement device, rotarod, mouse, 712
 - tachometer, 1907
- movement perception**, adaptation, differential sensitivity, 554
 - model, visual memory, forward inhibition, 1636
 - model, vision, detection model, 2048
- moyamoya disease**, computer assisted tomography, 20 cases, 1203
- m scan**, a scan, b scan, echooculography, ultrasonics, new device, 2167
- mucocele**, blindness, computer assisted tomography, epiphora, exophthalmos, headache, ophthalmoplegia, paranasal sinus, ptosis, 4 cases, 2737
 - computer assisted tomography, face, paranasal sinus, rhinopharynx cancer, skeleton, 1962
- muller lyer illusion**, contrast, mathematic model, perception, 2047
- multichannel analyzer**, air pollution, digital computer, fluorescence, roentgen radiation, serum, 3277
 - cesium 137, cobalt 58, cobalt 60, pulse height analysis, gamma radiation, 10 x 10 channel, 189
- multichannel recorder**, alpha rhythm, computer, electroencephalography, rem sleep, sleep, 10 subjects, automation, 2706
 - electrocardiography, electroencephalography, tape recorder, telemetry, digital recording, 1360
 - electroencephalography, epilepsy, tape recorder, telemetry, 27 days recording, 976
 - integrated circuit, monitoring, telemetry, 970
- multidimensional tomography**, image production, tomography, reconstruction from sinogram, 3385
- multiphasic testing**, case finding, medical record, outpatient department, multiphasic screening group, chart abstract group, chart review group, comparisons, 835
 - periodic medical examination, preventive medicine, screening test, principals for application, usa, 604
- multiple choice test**, computer, medical education, medical school, u.k., 1558
- multiple electrode**, electrode, electromyography, 2135
- multiple myeloma**, calculator, cancer staging, mathematic model, calculator program, pocket calculator, 330
 - cancer chemotherapy, immunoglobulin g, optimal control analysis, gompertzian model, mathematical model, 782
- multiple sclerosis**, alcoholism, alzheimer disease, brain atrophy, computer assisted tomography, dementia, parkinson disease, progressive multifocal leukoencephalopathy, schilder disease, survey, 358
 - brain white matter, computer assisted tomography, demyelination, optic nerve, 100 cases, diagnosis, 3829
 - computer assisted tomography, 3 cases, 3828
 - electroencephalography, evoked somatosensory response, 1748
- multiple trauma**, computer, mathematic model, nomogram, prognosis, respiration, trauma, 2 prognostic indices, 172 cases, 426

- computer, mathematic model, mortality, trauma, trauma indices, predictions, 425
- multiplexer**, ad converter, automation, information processing, laboratory, microprocessor, modules marketing, 2519
- telemetry, 120
- multivariate analysis**, decision theory, diagnosis, mathematic model, symptoms, 337
 - statistics, chi test, 17
- multivibrator**, v.d. pol equation, 115
- multiwire chamber**, conization chamber, image processing, roentgen radiation, 314
- muscle**, acceleration, computer program, head, impact, mathematic model, neck, math modelling, volunteers, 1266
 - acoustic impedance, erythrocyte, kidney, liver, sound velocity, tissue, ultrasonics, viscosity, shear acoustic impedance, 58
 - actin, actomyosin, adenosine triphosphatase, calcium, model, myosin, quantitative model, 890
 - actin, adenosine triphosphatase, model, myosin, troponin, 48
 - action potential, muscle fiber membrane potential, human, muscle anisotropy, 2462
 - anisotropy, heart muscle membrane potential, mathematic model, membrane potential, nerve, syncytium, dog, 3184
 - biomechanics, mathematic model, muscle contraction, 1667
 - computer model, locomotion, locomotor system, 1668
 - dielectric constant, microwave radiation, tissue water, rotational water mobility, 184
 - dielectric constant, electric field, electromagnetic radiation, 2851
 - diffractometer, light diffraction, muscle contraction, muscle length, photodiode, sarcomere, sarcomere length determination, 3362
 - elasticity, viscosity, resting muscle, frog, 893
 - electrode, electromyography, surface electrode, high pass filter technique, 2644
 - electromyography, forearm, mathematic model, neuromuscular system, 2427
 - exercise, mathematic model, muscle temperature, thermodynamics, thigh muscle, analytical solution, human, 2434
 - krypton 85, multiexponential washout, dog, 1420
 - lumbar spine, mathematic model, muscle force, spine, 7 muscle shapes, 430
- muscle blood flow**, blood vessel resistance, papaverine, sympathectomy, vasodilatation, rate sensitivity regulation, cat, 645
- muscle contraction**, actin f, thermodynamics, elastic modulus, actin actin bond strength, thermodynamics, conformational change, 1267
 - adenosine diphosphate, adenosine triphosphate, model, quantum theory, sliding filament theory, transducer, quantum mechanical transducer model, 2033
 - adenosine triphosphate, filament, myosin, sliding filament theory, molecular mechanism, 444
 - adenosine triphosphate, model, cross bridge model, 3142
 - bicycle ergometry, electromyography, muscle load, special ergometer, human muscle, 3749
 - biomechanics, mathematic model, muscle, 1667
 - calcium, magnesium adenosine triphosphate, muscle model, muscle relaxation, rabbit, 45
 - cell membrane receptor, mathematic model, kinetic model, 2814
 - computer, electromyography, jaw, mastication, man, 1613
 - computer, light diffraction, muscle fiber, muscle tetanic contraction, sarcomere, frog, in vitro, 2373
 - diffractometer, light diffraction, muscle, muscle length, photodiode, sarcomere, sarcomere length determination, 3362
 - feedback system, mathematic model, movement, muscle tone, human arm model, 3523
 - force transducer, implant, telemetry, uterine tube, monkey, 1770
 - heart muscle, hill model, mathematic model, muscle isometric contraction, analytical solution, 3522
 - mathematic model, model, kinetics, 2801
 - mathematic model, motor unit, cybernetic control model, 2813
 - mathematic model, two state model, 2032
 - mathematic model, motor unit, muscle isometric contraction, recruitment, rate coding, 1661
 - mathematic model, movement, voluntary movement, optimal voluntary control, 1659
 - model, quantum mechanics, sliding filament theory, quantum mechanical formation, 2419
 - model, protein switch, catastrophe model, 2806
 - thermodynamics, mechanochemical system, 3526
 - thermodynamics, 1679
 - sequential contraction, 8 volunteers, 710
- muscle disease**, brain tumor, eye movement, malignant exophthalmos, myasthenia gravis, oculomotor paralysis, 118 cases, micromovement recording device, 270
 - computer, electromyography, motor unit, neuropathy, spike, computer analysis, 26 subjects, 75 muscles, human, 1953
 - display system, electromyography, extraocular muscle, neuropathy, spike, visual display, 704

muscle fiber, acetylcholine, tissue culture, voltage clamp, in vitro, chicken, 92

- calcium, glycerol, troponin, psoas muscle, filament overlap, rabbit, 3146
- cerebellum cortex, compartment model, computer model, nerve cell network, 1729
- computer, light diffraction, muscle contraction, muscle tetanic contraction, sarcomere, frog, in vitro, 2373
- digital computer, light diffraction, refraction index, sarcomere, ccd, 177
- microelectrode, ph electrode, soleus muscle, mouse, 1005

muscle fiber contraction, computer, muscle tone, tensiometer, electro optical transducer, tension fluctuation, single muscle contraction, 2422

muscle fiber membrane, biological model, computer model, muscle fiber membrane resistance, cable model, parameter determination, 1317

- calcium, myotonia, mathematical model, 1672

muscle fiber membrane capacitance, muscle fiber membrane resistance, transverse tubular system, low frequency impedance, frog, 1719

muscle fiber membrane potential, action potential, muscle, human, muscle anisotropy, 2462

- diaphragm, mathematic model, neuromuscular system, rat, 1315

muscle fiber membrane resistance, biological model, computer model, muscle fiber membrane, cable model, parameter determination, 1317

- muscle fiber membrane capacitance, transverse tubular system, low frequency impedance, frog, 1719

muscle force, arthrosis, knee, maximum stress evolution, 1269

- biceps brachii muscle, electromyography, 1905
- lumbar spine, mathematic model, muscle, spine, 7 muscle shapes, 430

muscle isometric contraction, electromyography, minicomputer, spike, 1954

- gastrocnemius muscle, mathematic model, linear equation, rat, 1660
- hand dorsal interosseus muscle, mathematic model, motor unit, human, 929
- heart muscle, hill model, mathematic model, muscle contraction, analytical solution, 3522
- mathematic model, motor unit, muscle contraction, recruitment, rate coding, 1661

muscle length, diffractometer, light diffraction, muscle, muscle contraction, photodiode, sarcomere, sarcomere length determination, 3362

muscle load, bicycle ergometry, electromyography, muscle contraction, special ergometer, human muscle, 3749

muscle model, calcium, magnesium adenosine triphosphate, muscle contraction, muscle relaxation, rabbit, 45

muscle performance, bicycle ergometry, exercise, crank force, one or two leg cycling, 443

- electromyography, fatigue, triceps surae muscle, total torque, weighted emg sum, man, 2029
- energy, running, walking, work, level walking, 1121

muscle relaxation, audioamplifier, electroconvulsive therapy, electromyography, 1500

- calcium, magnesium adenosine triphosphate, muscle contraction, muscle model, rabbit, 45
- monitoring, nerve block, nerve stimulation, 3329

muscle spindle, computer, nerve potential, primary ending, cat, averager, computer method, cross correlating technique, 1325

- extrafusil muscle fiber, fusimotor muscle, mathematic model, beta nerve fiber, chelonian spindle, 496

muscle strength, ankle, biomechanics, strength duration curve, tibialis anterior muscle, model, dog, 287

- electromyography, fatigue, back muscle strength, shoulder arm strength, determination, apparatus, 1116
- grip strength, mouse, rat, recording device, 3361

muscle temperature, exercise, mathematic model, muscle, thermodynamics, thigh muscle, analytical solution, human, 2434

muscle tetanic contraction, computer, light diffraction, muscle contraction, muscle fiber, sarcomere, frog, in vitro, 2373

muscle tone, abdominal wall, fentanyl, rectus abdominis muscle, transducer, measurement, 143

- computer, muscle fiber contraction, tensiometer, electro optical transducer, tension fluctuation, single muscle contraction, 2422
- feedback system, mathematic model, movement, muscle contraction, human arm model, 3523
- spasticity, relative equivalent damping measure, computer analysis, apparatus, 43

muscle water, nuclear magnetic resonance, oxygen isotope, sartorius muscle, transverse longitudinal resonance, frog, 3201

muscular dystrophy, alcoholism, amyotrophic lateral sclerosis, anterior tibial muscle, biceps brachii muscle, electromyography, motoneuron disease, polyneuropathy, muaps, automatic analysis, 14 controls, 11 cases, 857

- cerebral palsy, electromyography, gait, hemiparesis, telemetry, temporal information, 100 cases, 1904

music, cerebellum cortex, memory, nerve cell network, pattern recognition, purkinje cell, d neuronal network, 1732

- hearing, timbre evaluation, 1511

mutation, gene frequency, inheritance, migration, population model, statistics, stochastic model, island model, 2788

myasthenia gravis, brain tumor, eye movement, malignant exophthalmos, muscle disease, oculomotor paralysis, 118 cases, micromovement recording device, 270

- computer assisted tomography, thymoma, tomography, 6 cases, 3415
- myelin**, computer, morphometrics, nerve cell, rat, 2303
- myelinization**, cable, model, nerve fiber, saltatory conduction, test theory, 1727
- myelography**, ankylosing spondylitis, cauda equina, computer assisted tomography, case report, man of 68, 3074
 - arnold chiari malformation, computer assisted tomography, metrizamide, syringomyelia, 20 cases, 3765
 - cervical spine traction, tomography, traction device, 2274
- myeloid leukemia**, computer assisted tomography, leukoencephalopathy, methotrexate, necrotic leukoencephalopathy, computed tomography, woman of 39, female 39 yrs, clinical course, 371
- myoelectric control**, above knee prosthesis, electromyography, leg prosthesis, leg controller, 2263
 - biofeedback, occupational therapist, orthotics, prosthesis, 1113
- myoglobin**, diffusion, hemoglobin, oxygen, facilitated diffusion, 466
 - gas diffusion, gas exchange, hypoxia, tissue cylinder, 2450
- myopia**, telescope, vision, dioptric setting, light level, 1409
- myosin**, actin, actomyosin, adenosine triphosphatase, calcium, model, muscle, quantitative model, 890
 - actin, adenosine triphosphatase, model, muscle, troponin, 48
 - adenosine triphosphatase, circular dichroism, heart failure, heart muscle, electron microscopy, dog, 632
 - adenosine triphosphate, filament, muscle contraction, sliding filament theory, molecular mechanism, 444
- myositis**, computer assisted tomography, exophthalmos, hemangioma, meningioma, tumorous and nontumorous exophthalmos, 90 cases, 802
- myotonia**, calcium, muscle fiber membrane, mathematical model, 1672
- nail**, finger nail, physical measurement device, 2417
- naloxone**, beta endorphin, gating circuit, iontophoresis, accurate current monitoring system, 3209
- naphthalene sulfonate derivative**, cell membrane permeability, erythrocyte membrane, thermodynamics, 3152
- nasal speech**, consonant, speech, linear predictive code, 902
- nasogastric tube**, accident, burn, catheter, fire risk, oxygen breathing, case, 229
 - esophagus, foreign body, magnet, stomach, magnetic removal, 613
- nausea**, drowsiness, electricity, excitability, fatigue, headache, worker, high voltage field, environmental effects, 3106
- nebulization**, lung, radiography, radioisotope, 2288
- neck**, acceleration, gravitational stress, hand, mathematic model, human head neck system, dynamic response, predictive model, 3008
 - acceleration, gravitational stress, head, head neck dynamic response, 3007
 - acceleration, computer program, head, impact, mathematic model, muscle, math modelling, volunteers, 1266
 - acceleration, computer program, head, impact, intervertebral disk, comprehensive, three dimensional head neck model, 2650
 - acceleration, computer model, head, impact, mathematic model, motor vehicle crash victim, calspan 3 d computer simulator, 2426
 - arteriography, arteriotomy, brachial angiography, brachial artery, brain atherosclerosis, carotid artery, heart catheterization, 258 cases, 3755
 - computer assisted tomography, hyperparathyroidism, mediastinum, parathyroid adenoma, 10 cases, 797
- neck muscle**, behavior, electromyography, head movement, photography, vision, 2638
- necrosis**, cancer graft, cancer growth, magnetic field, neuroblastoma, alternating magnetic field, mice, tumor c 1300, 1396
- necrotic leukoencephalopathy**, computer assisted tomography, leukoencephalopathy, methotrexate, myeloid leukemia, computed tomography, woman of 39, female 39 yrs, clinical course, 371
- needle**, amniocentesis, spring loaded amniocentesis needle, 1144
 - liver vein, portal vein blood pressure, 100 patients, percutaneous transhepatic measurement, chiba needle, method, wedge pressure, 1465
- needle electrode**, brain depth stimulation, corrosion, electrostimulation, nervous system, biphasic stimulation, 2228
 - electrode, heart muscle, multipolar electrode, beating heart, construction, 2923
- negative pion radiation**, cell survival, fast neutron radiation, roentgen radiation, 3203
 - dosimetry, radiotherapy, roentgen dose distribution, 1127
 - radiation detection, radiation field, roentgen dose distribution, charge collector, 3567
 - radiotherapy, pion filter, 1542
- neon**, equation, gas bubble, lung diffusion, nitrogen, oxygen, respiration, counter diffusion, 2051
- nephrectomy**, computer, kidney transplantation, misleading data base, 854
- nephrolithiasis**, pyelostomy, radiography, miniature vacuum cassette, 1531
- nephron**, arteriole resistance, kidney concentrating capacity, kidney medulla, model, rabbit, central core model, 916
- nephrostomy**, computer assisted tomography, pyelography, 2 cases, 827

neptunium 237, neutron dosimetry, subthreshold fission, 2907

nerve, anisotropy, heart muscle membrane potential, mathematic model, membrane potential, muscle, syncytium, dog, 3184

nerve block, biopsy, computer assisted tomography, interventional scanning, 160 cases, 2743

- monitoring, muscle relaxation, nerve stimulation, 3329

nerve cell, alcian blue, microelectrode, electrode tip labelling, cat, 1886

- brain blood flow, brain cortex, microelectrode, technique of recording, cat, hydrogen clearance method, 1085
- cell membrane, diving, heart rate, hydrostatic pressure, pacemaker, mouse, rat, guinea pig, rabbit, dog, 3692
- cell membrane, cell membrane impedance, ion transport, mathematic model, 2079
- cognition, hemisphere, imagination, nerve cell network, perception, visual cortex, visual nerve cell, model, 86
- computer, morphometrics, myelin, rat, 2303
- computer, stimulus, threshold, 2757
- computer, display system, ultrastructure construction, 2071
- desmosome, mathematic model, nerve fiber, nerve resistance, septum resistance, nexuses, earthworm, 997
- excitatory postsynaptic potential, inhibitory postsynaptic potential, mathematic model, stochastic model, automation model, 2466
- granular cell, hippocampus, information science, mathematic model, synapse, information theory, 2081
- information processing, nerve cell network, stochastic model, 3561
- mathematic model, parameter estimation, 937
- mathematic model, volterra representation, 1726
- model, photoreceptor, postsynaptic receptor, presynaptic receptor, retina, synapse transmission, 2844
- nerve cell potential, nonlinear system, signal processing, 1741
- nerve cell potential, sodium, horse leech, 3191

nerve cell code, brain, information processing, information science, 489

- information processing, smelling, 269

nerve cell membrane, cell membrane permeability, hodgkin huxley equation, mathematic model, complex admittance, squid, 2841

- hodgkin huxley equation, nerve cell membrane capacitance, nerve cell potential, renshaw cell, time, repetitive firing, model, 1724

nerve cell membrane capacitance, hodgkin huxley equation, nerve cell membrane, nerve cell potential, renshaw cell, time, repetitive firing, model, 1724

nerve cell membrane conductance, calcium, mathematic model, pacemaker nerve cell, 3554

nerve cell membrane potential, barium, computer model, tetrodotoxin, aplysia, 2467

- cell membrane potential, fluorescence, thermodynamics, 2838
- information processing, mathematic model, nerve cell network, nonlinear system, statistics, 2069
- nerve cell membrane resistance, roentgen radiation, snail, 2074
- current fluctuation, 2470

nerve cell membrane resistance, nerve cell membrane potential, roentgen radiation, snail, 2074

nerve cell membrane steady potential, dorsal spinocerebellar tract, mathematic model, nerve cell potential, potassium, afterhyperpolarization, cat, 3179

nerve cell network, behavior, decision, mathematic model, motivation, statistics, stimulus, behavioral mode selection, 399

- brain, mathematic model, memory, associative memory, 3187
- brain section, computer, neuron tree reconstruction from several sections, 3854
- cerebellum, computer model, mathematic model, purkinje cell, frog, 487
- cerebellum cortex, computer model, mathematic model, purkinje cell, frog, 1717
- cerebellum cortex, memory, music, pattern recognition, purkinje cell, d neuronal network, 1732
- cerebellum cortex, compartment model, computer model, muscle fiber, 1729
- cerebellum cortex, golgi cell, mathematic model, golgi cell function, 3558
- circadian rhythm, mathematics, swimming, differential equation, fish, 3553
- cognition, hemisphere, imagination, nerve cell, perception, visual cortex, visual nerve cell, model, 86
- computer model, nerve cell potential, 2837
- digital computer, lateral geniculate body, vision, visual system, cat, 2380
- electroencephalography, epilepsy, excitatory postsynaptic potential, feedback system, filter, inhibitory postsynaptic potential, model, neuron population, 3548
- frequency modulation, mathematic model, 2084
- hippocampus, mathematic model, nerve cell potential, ca sub 3, 3192
- information processing, mathematic model, nerve cell membrane potential, nonlinear system, statistics, 2069
- information processing, nerve cell, stochastic model, 3561
- inhibition, model, 1725
- lateral geniculate body, mathematic model, cat, 3186

- learning, mathematic model, memory, pattern recognition, potassium channel, sodium channel, synapse, 1316
- mathematic model, retina, object identification, 682
- mathematic model, 2834
- mathematic model, rhythmic activity, spike, snail, 1728
- mathematic model, 2073
- mathematic model, seizure, spatiotemporal pattern, 1327
- monosynaptic pathway, system analysis, 1731
- stereoscopic vision, neuronal model, 3536
- brindley nerve net, 3188
- nerve cell potential**, artifact reduction, microiontophoresis, raphe nucleus, stimulation artifact, technique, 188
 - brain, electrode, film electrode probe, 2545
 - brain cortex, brain depth recording, brain pulsation, apparatus, pulsating brain, 669
 - brain cortex, signal noise ratio, signal processing, spike train, extracellular recording, 2083
 - brain depth recording, microelectrode, floating mobile electrode, frog, 246
 - brain depth stimulation, lateral hypothalamus, medial forebrain bundle, strength duration curve, rat, 3182
 - calculator, histogram, microcomputer, 2234
 - computer, dorsal root potential, microelectrode, spinal cord posterior horn, substantia gelatinosa, very small neuron, activity isolation method, mouse, 1238
 - computer model, nerve cell network, 2837
 - computer model, mechanoreceptor, nonlinear systems analysis, crayfish, 3195
 - computer model, semicircular canal, pigeon, 2416
 - counter, spike, event counter, 1355
 - decerebration, recurrent inhibition, renshaw cell, dynamic properties, extracellular recording, cat, 1735
 - dorsal spinocerebellar tract, mathematic model, nerve cell membrane steady potential, potassium, afterhyperpolarization, cat, 3179
 - electroencephalography, preamplifier, unrestrained animals, 110
 - electroencephalography, electroretinography, microelectrode, oxygen electrode, platinum electrode, double barrelled electrode, simultaneous measurement, 2142
 - excitatory postsynaptic potential, mathematic model, spike, interspike time distribution, 2849
 - feedback system, mathematic model, model encoders, 1331
 - fet semiconductor, model, 1743
 - frequency modulation, microelectrode, telemetry, compact miniature system, rat, rabbit, 2619
 - hippocampus, mathematic model, nerve cell network, ca sub 3, 3192
 - hodgkin huxley equation, nerve cell membrane, nerve cell membrane capacitance, renshaw cell, time, repetitive firing, model, 1724
 - laser, microelectrode, multi microelectrode array, microelectrode processing, 2547
 - lateral eye, mathematic model, limulus, 1696
 - lateral geniculate body, mathematic model, visual field, space time weight function, 3185
 - lateral geniculate body, mathematic model, red nucleus, reticular formation, spike, markov model, ventrobasal complex, 1313
 - mathematic model, retina ganglion cell, retina ganglion cell potential, interspike interval, goldfish, 2046
 - mathematic model, mechanoreceptor, nonlinear system analysis, crayfish, 3194
 - mathematic model, memory, synapse, memory storage capacity, 3181
 - mathematic model, spike, statistics, 3557
 - mathematic model, firing interval moment, 3560
 - microelectrode, recording method, active rat, 2623
 - microelectrode, nerve fiber potential, signal noise ratio, chronic recording, tube electrodes, 559
 - micromanipulator, cat, 1502
 - nerve cell, nonlinear system, signal processing, 1741
 - nerve cell, sodium, horse leech, 3191
 - nervous system, pulse height analysis, spike, delay line, analog delay, 1492
 - newborn, vestibulocochlear nerve, recording method, rat, 2887
 - stochastic model, ten hoopen reuver model, 1318
 - self resetting peak detector, 247
- nerve conduction**, breathing, mathematic model, vagus nerve, rhythmogenesis, lotka volterra model, 467
 - computer model, nerve potential, temperature, axon branch point, squid, 2474
 - computer model, mathematic model, ranvier node, 2847
 - latent period, motor nerve, signal processing, transfer, 1751
 - mathematic model, nerve fiber membrane potential, 3189
 - mathematic model, nerve potential, volume conductor, 1739
 - mathematic model, nerve potential, local impulse existence, 3559
 - mathematic model, nerve potential, spike interval, 1328

- mathematic model, temporal stability, 2846
- motor nerve, prototype device, 3324
- nerve fiber, ranvier node, spike, theory, method, 2072
- nerve excitability**, mathematic model, nerve fiber, 2480
- nerve fiber**, cable, model, myelination, saltatory conduction, test theory, 1727
 - capsule, endoneurium pressure, interstitial fluid, lead, polyethylene, sciatic nerve, rat, 151
 - desmosome, mathematic model, nerve cell, nerve resistance, septum resistance, nexuses, earthworm, 997
 - hodgkin huxley equation, nerve fiber membrane potential, synapse, white noise, squid, 933
 - hodgkin huxley equation, nerve fiber membrane potential, model modifications, crab, 495
 - interferometry, laser, nerve fiber potential, size changes, crayfish, 1498
 - mathematic model, nerve excitability, 2480
 - nerve conduction, ranvier node, spike, theory, method, 2072
- beta nerve fiber**, extrafusal muscle fiber, fusimotor muscle, mathematic model, muscle spindle, chelonian spindle, 496
- nerve fiber membrane**, calcium, molecular structure, sodium conductance, squid, 3552
 - cell membrane conductance, gating circuit, potassium channel, sodium channel, transient polarization current, squid, 2070
 - cell membrane permeability, chloride, nerve fiber membrane permeability, nerve fiber membrane steady potential, ph, potassium, sodium, crayfish, 1718
 - excitable membrane, lipid membrane, membrane potential, 394
 - excitable membrane, lipid membrane, membrane permeability, potassium, sodium, didactic presentation, 393
 - gating circuit, electrostatic interaction, 2836
 - heart muscle fiber, hodgkin huxley equation, mathematic model, hodgkin-huxley model, 2078
 - lipid membrane, membrane potential, non linear electric affects, 1736
 - molecular biology, nerve potential, thermodynamics, squid, rabbit, 1677
- nerve fiber membrane capacitance**, hodgkin huxley equation, mathematic model, squid, 2840
- nerve fiber membrane permeability**, cell membrane permeability, chloride, nerve fiber membrane, nerve fiber membrane steady potential, ph, potassium, sodium, crayfish, 1718
- nerve fiber membrane potential**, electric field, frequency analysis, mathematic model, volume conductor, 932
 - gating circuit, sodium channel, gating current blocking, squid, 3550
 - hodgkin huxley equation, nerve fiber, synapse, white noise, squid, 933
 - hodgkin huxley equation, sodium channel, tetrodotoxin, 931
 - hodgkin huxley equation, nerve fiber, model modifications, crab, 495
 - mathematic model, nerve conduction, 3189
 - nerve fiber potential, sodium pump, tetrodotoxin, myxicola, 1326
- nerve fiber membrane steady potential**, cell membrane permeability, chloride, nerve fiber membrane, nerve fiber membrane permeability, ph, potassium, sodium, crayfish, 1718
 - dendrite, nonlinear electrotonus, 3546
- nerve fiber potential**, dipole theory, mathematic model, 3175
 - excitation, movement, 490
 - interferometry, laser, nerve fiber, size changes, crayfish, 1498
 - microelectrode, nerve cell potential, signal noise ratio, chronic recording, tube electrodes, 559
 - nerve fiber membrane potential, sodium pump, tetrodotoxin, myxicola, 1326
- nerve potential**, acoustic nerve, hearing, two tone stimulus, 2441
 - acoustic nerve, summed action potential, locusta, 1330
 - band pass filter, information processing, mathematic model, vision, visual stimulation, non linear spatial filter, 912
 - computer, muscle spindle, primary ending, cat, averager, computer method, cross correlating technique, 1325
 - computer model, nerve conduction, temperature, axon branch point, squid, 2474
 - conductivity, nerve steady potential, nervous system, isolated nerve, frog, 479
 - mathematic model, optimal filtering, 1723
 - mathematic model, nerve conduction, volume conductor, 1739
 - mathematic model, nerve conduction, local impulse existence, 3559
 - mathematic model, nerve conduction, spike interval, 1328
 - molecular biology, nerve fiber membrane, thermodynamics, squid, rabbit, 1677
 - pain, sensory nerve, tooth, recording method, 674
- nerve resistance**, desmosome, mathematic model, nerve cell, nerve fiber, septum resistance, nexuses, earthworm, 997
- nerve section**, optic nerve, retractor, nerve viewing and sectioning, rat, 667
- nerve steady potential**, conductivity, nerve potential, nervous system, isolated nerve, frog, 479
- nerve stimulation**, automation, electromyography, evoked muscle response, facial nerve paralysis, automatic electronic device, maximal stimulation test, 2759
 - cranial nerve, electrode, electrostimulator, pons angle, apparatus, 678

- herpes zoster, neuralgia, pain, phantom pain, thalamus, 46 cases, electrode placement, 249
- monitoring, muscle relaxation, nerve block, 3329
- powered prosthesis, sensory nerve, tactile discrimination, vibration, human, 1902
- nervous system**, brain depth stimulation, corrosion, electrostimulation, needle electrode, biphasic stimulation, 2228
 - cell membrane, constant current stimulator, electrostimulator, membrane potential, current rectification, resistance measurement, 1491
 - conductivity, nerve potential, nerve steady potential, isolated nerve, frog, 479
 - electrode, electrostimulation, platinum electrode, electrochemical reaction, 1490
 - electrostimulator, implant, 2626
 - mathematic model, 1323
 - nerve cell potential, pulse height analysis, spike, delay line, analog delay, 1492
- neuralgia**, herpes zoster, nerve stimulation, pain, phantom pain, thalamus, 46 cases, electrode placement, 249
- neurinoma**, acoustic nerve neurinoma, cisternography, computer assisted tomography, metrizamide, pons angle tumor, 10 cases, 3841
 - brain lesion, computer assisted tomography, spinal cord lesion, syringomyelia, diagnosis, 1190
- neuroblastoma**, cancer graft, cancer growth, magnetic field, necrosis, alternating magnetic field, mice, tumor c 1300, 1396
- neurogenic bladder**, bladder, computer model, model, 2458
- neuroleptic agent**, hospital, maladjustment, medical record, mental disease, schizophrenia, adolescent, 2369
- neurolinguistics**, aphasia, model, 1077
- neurology**, decision theory, diagnosis, mathematic model, 338
- neuromuscular disease**, electrostimulation, minicomputer, orthosis, peroneus nerve paralysis, design methodology, 1239
- neuromuscular synapse**, calcium, endplate potential, magnesium, mathematic model, non linear summation, martin formula, frog, 3196
 - computer model, mathematic model, interspike interval sequence, 3193
- neuromuscular system**, diaphragm, mathematic model, muscle fiber membrane potential, rat, 1315
 - electromyography, forearm, mathematic model, muscle, 2427
 - energy transfer, mathematic model, motor unit, energy optimal control, 1722
- neurootology**, acoustic impedance, brain stem, pons angle tumor, stapes reflex, diagnostic value, 1683
- neuropathy**, computer, electromyography, motor unit, muscle disease, spike, computer analysis, 26 subjects, 75 muscles, human, 1953
 - computer assisted tomography, echooculography, hyperthyroidism, orbit cancer, orbit nerve, orbit tumor, 144 cases, 1221
 - denervation, electromyography, motoneuron disease, automatic analysis, 1955
 - display system, electromyography, extraocular muscle, muscle disease, spike, visual display, 704
- neuroradiology**, computer assisted tomography, electroencephalography, comparison, 1202
- neurosurgery**, brain hematoma, brain stem compression, cerebellum hemorrhage, computer assisted tomography, hypertension, 10 cases, 3827
 - computer assisted tomography, postoperative care, 784
- neurotransmitter**, electromagnetic radiation, microwave radiation, receiver, telemetry, 183
 - mathematic model, transmitter kinetics, 1734
 - mathematic model, memory, synapse transmission, non linear model, 2235
- neurovirulence**, attenuated virus, central nervous system, live vaccine, lumbar spine, mathematic model, poliomyelitis virus, thalamus, virus, virus virulence, neurovirulence assay, monkey, 3492
- neutron activation analysis**, body burden, bone, computer, plutonium 239, 811
 - liver, trace element, determination of bulk and trace elements, bovine liver, 2894
 - neutron radiation, flux monitoring, 2161
 - neutron radiation, neutron uniformity, 3256
 - plutonium dioxide pu 239, alpha decay, fragmentation of respirable puo2 particles in water, 1421
- neutron detection**, computer, nuclear reactor, reactivity meter, 1823
 - megavoltage radiotherapy, silicon diode, photon, electron response, 3562
- neutron dosimetry**, fast neutron radiation, silicon diode, in vivo dosimetry, 743
 - neptunium 237, subthreshold fission, 2907
 - thermoluminescence dosimeter, cellulose nitrate film, personnel monitoring, 1539
- neutron generator**, beryllium, deuteron radiation, dosimetry, fast neutron radiation, fast proton radiation, characterization of neutron beam, 2662
- neutron radiation**, attitude, aviation, cosmic radiation, mid altitude flight, 3675
 - betatron, dosimetry, linear accelerator, radiation exposure, 2852
 - calcium fluoride dosimeter, lithium fluoride dosimeter, radiotherapy, thermoluminescence dosimeter, 1920
 - chopper, pulse generator, propagation speed, 3674
 - collimator, fast neutron radiation, radiation scattering, 596
 - cryogenics, nuclear radiation, spectrometry, 1014

- deuteron radiation, fast neutron radiation, fast particle radiation, fast proton radiation, lithium, 3254
- dosimetry, gamma radiation, determination of dosimeter sensitivity, 2160
- linear energy transfer, phantom, pion radiation, radiotherapy, roentgen dose distribution, 1198
- neutron activation analysis, flux monitoring, 2161
- neutron activation analysis, neutron uniformity, 3256
- neutron radiography, equipment, method, 1425
- neutron radiography**, neutron radiation, equipment, method, 1425
- neutron spectrometry**, linear accelerator, neutron therapy, least square technique, neutron spectra from bonner sphere data, 2854
- megavoltage radiotherapy, radiation field, thermoluminescence dosimeter, 2279
- neutron therapy**, cancer, computer, radiotherapy, roentgen dose distribution, G.D.R., 1976
- linear accelerator, neutron spectrometry, least square technique, neutron spectra from bonner sphere data, 2854
- radiation beam, radiation dose fractionation, 2906
- neutrophil granulocyte**, SEE polymorphonuclear granulocyte
- newborn**, arterial oxygen tension, monitoring, oxygen tension electrode, skin oxygen tension, 3633
- artificial ventilation, positive end expiratory pressure, resuscitator, manual ventilation, peep device, continuous positive pressure, new device, 3709
- body, heat transfer, homeothermia, mathematic model, thermoregulation, body insulation, critical size, 897
- body temperature, thermoregulation, temperature measurement, mouse, 2580
- computer, information system, intensive care, medical record, data error rate, 2364
- computer, information processing, respiratory distress syndrome, 3852
- digital indicator, monitoring, vibration, rat, 1551
- heart failure, thermography, 37 newborns, diagnostic methods, 578
- infant, tracheotomy, infant tracheal retractor, 3266
- nerve cell potential, vestibulocochlear nerve, recording method, rat, 2887
- newborn surgery**, computer program, parenteral feeding, 844
- nicotinamide adenine dinucleotide**, computer model, energy transfer, glucose, glycolysis, heart muscle, heart perfusion, reduced nicotinamide adenine dinucleotide, rat, 1631
- night blindness**, image intensifier, retina pigment degeneration, visual aid, 1516
- night vision**, adaptometry, dark adaptation, new device, 3342
- information processing, luminance, mathematic model, photoreceptor, visual field, 3537
- nitinol**, artificial heart, artificial muscle, contractile artificial muscle, 1852
- nitrogen**, air, argon, bubble, gas exchange, bubble formation measurement, 1348
- carbon dioxide, gas, gas chromatography, oxygen, scholander method, 1394
- equation, gas bubble, lung diffusion, neon, oxygen, respiration, counter diffusion, 2051
- extracorporeal circulation, gas embolism, oxygenator, possible contra indication, 1481
- gas diffusion, gas mixing, helium, oxygen, water vapor, binary and ternary diffusion, 1295
- nitrogen oxide**, air pollution, carbon monoxide, hydrochloric acid, hydrofluoric acid, infrared radiation, sulfur dioxide, 233
- nitrous oxide**, anesthesia, monitoring, oxygen consumption, surgery, oxygen measurement, 1934
- noise**, amplitude modulator, hearing, pure tone audiometry, tone roughness, 56
- annoyance, community, environmental sanitation, loudness, perception, pollution, loudness scaling, 256
- auditory masking, binaural hearing, phasic effect, 1686
- auditory masking, hearing, intelligibility, pure tone stimulus, 1505
- auditory system, psychoacoustics, detection of temporal gaps, decay of sensation, 1282
- binaural hearing, hearing, pitch perception, review, 900
- cell membrane conductance, mathematic model, membrane, 2409
- computer assisted tomography, gamma counting, statistics, general expression, 1176
- computer program, industrial medicine, sound level, cost computation, 2168
- deafness, hearing aid, intelligibility, signal noise ratio, speech discrimination, 34 patients, peak clipping, automatic pain control, 2628
- decision, information processing, signal detection, vision, multiple channel, human, 1694
- dosimetry, industrial hygiene, audio dosimeter, 2912
- ear protection, german federal republic, choice, 3750
- ear trauma, hearing, industrial noise, noise pollution, chinchilla, threshold shift, 1283
- ion transport, membrane permeability, theoretical study, 2390
- loudness, loudness growth, 100 hz tone, 3529
- signal noise ratio, noise evaluation, 30
- noise generator**, cell membrane, cell membrane potential, mathematic model, 2843
- cell membrane, cell membrane potential, 2842
- environment, model, noise pollution, spectrometry, traffic, 1426
- analog generator, 3581
- noise pollution**, age, auditory threshold, hearing, hearing impairment, population research, 684

- dosimetry, sound level measurement, ear borne dosimeter, 1509
- ear protection, industrial medicine, performance, 3350
- ear trauma, hearing, industrial noise, noise, chinchilla, threshold shift, 1283
- environment, model, noise generator, spectrometry, traffic, 1426
- industrial medicine, industrial noise, sound level measurement, large machine in situ, 3262
- industrial medicine, industrial noise, sound level measurement, in situ measurement, 3261
- industrial medicine, industrial noise, sound level measurement, reflecting plane, 3260
- industrial medicine, industrial noise, sound level measurement, 3259
- industrial medicine, industrial noise, sound level measurement, indoors installed machine, 3258
- pipe, 1430
- noise reduction**, vibration, testing damping material, 1027
- nomenclature**, computer, medical record, 3085
- nomogram**, computer, mathematic model, multiple trauma, prognosis, respiration, trauma, 2 prognostic indices, 172 cases, 426
- nonactin**, lecithin, lipid membrane, membrane steady potential, monazomycin, phosphatidylethanolamine, phospholipid, valinomycin, antibiotic membrane probe, 1247
- nonlinear system**, biofeedback, cheyne stokes breathing, chronic granulocytic leukemia, hematopoietic disease, mathematic model, process control, respiration, 1299
 - brain, computer model, oxygen consumption, 2627
 - chemical kinetics, signal noise ratio, 414
 - computer model, diffusion, population model, 1257
 - correlation function, information processing, wiener analysis, 1737
 - diffusion, ecology, equation, migration, population model, differential equation, multispecies model, stability, 876
 - diffusion, heat conduction, thermodynamics, diffusion equation, 1280
 - electrophysiology, information processing, 3124
 - hearing, model, signal processing, residuum, 2818
 - information processing, mathematic model, nerve cell membrane potential, nerve cell network, statistics, 2069
 - lung blood flow, mathematic model, 923
 - mathematic model, vision, spatial perception, 1691
 - mathematic model, pupil reflex, black box, 3158
 - mathematic model, membrane potential, spike, finite cable model, cable model, 1312
 - mathematic model, vision, 2448
 - nerve cell, nerve cell potential, signal processing, 1741
- nonbreathing system**, automotive exhaust, scavenging system, 319
- noradrenalin**, adenosine, adenosine triphosphate, adenylcyclase, computer model, coronary artery blood flow, cyclic amp, heart muscle ischemia, hypoxanthine, inosine, rat, 872
 - adenylcyclase, computer model, cyclic amp, heart muscle ischemia, hypoxanthine, inosine, phosphodiesterase, vasodilatation, rat, 2452
 - arteriole, blood pressure, capillary flow, centrifuge, gravitation, 2 g centrifugation, second generation rats, carotid artery, mesentery arteriole, 716
 - body temperature, dopamine, electric field, hyperthermia, hypothalamus, microwave radiation, serotonin, rat, 2579
 - carotid artery, clostridiopeptidase a, elasticity, hyaluronidase, iodoacetate sodium, model, pancreatopeptidase e, sodium cyanide, maxwell model, voigt model, 1656
- normotensive hydrocephalus**, cerebrospinal fluid, computer assisted tomography, hydrocephalus, penthanil yb 169, scintiscintigraphy, subarachnoid hemorrhage, 54 cases, 2721
- nose**, nose obstruction, nasal dilator, 230
- nose cavity**, computer assisted tomography, otorhinolaryngology, paranasal sinus, pons angle, applications, 9 selected cases, 2719
- nose obstruction**, nose, nasal dilator, 230
- nose reconstruction**, nose surgery, osteotomy, double chisel, new instrument, 3037
- nose surgery**, nose reconstruction, osteotomy, double chisel, new instrument, 3037
- notch filter**, active filter, operational amplifier, 112
 - active filter, 1765
 - active filter, parallel t filter, 1761
 - electric filter, selective amplifier, 512
 - interference suppression, t network, 3576
- nuclear energy**, artificial heart pacemaker, battery, cremation, explosion, mercury zinc batteries, lithium batteries, nuclear powered pacemakers, danger of explosion, britain, 2930
- nuclear magnetic resonance**, amplifier, cryogenics, signal noise ratio, 2153
 - averaging, iron 57, pulse generator, pulse echo, element analysis, 2858
 - chlorine, copper 65, element analysis, 2859

- cryogenics, 2568
- cryogenics, generator, stability, 182
- digital computer, echography, image processing, radiography, reprography, thermography, 3459
- digital computer, process control, spectrometry, 2531
- diode, semiconductor, calibration, 1010
- display system, image processing, 582
- electromagnetic radiation, electron spin resonance, generator, marginal oscillator, 1415
- fourier transform, image processing, element analysis, 2873
- fourier transform, phase detection, quadrature phase, 185
- hydrogen, tomography, phantom, rat, 3638
- image processing, proton image, 3776
- microwave radiation, signal detection, slotted resonator, 1417
- muscle water, oxygen isotope, sartorius muscle, transverse longitudinal resonance, frog, 3201
- radiofrequency generator, 1818
- receiver, spectrometry, blocking effect, 1416
- sample holder, multiple pulse angle spinning, 2154
- tomography, 2481
- double resonance, 1820
- nuclear medicine**, administration, computer, information processing, medical record, france, nancy, 2749
 - computer, quality control, 3833
 - computer, information system, radiography, automated system, 1971
 - computer, image processing, 3465
 - computer, dynamic study, 3834
- nuclear power plant**, carbon 14, environmental contamination, population exposure, radioactivity, c 14 production, 1334
- nuclear radiation**, amplifier, pulse amplifier, 2864
 - atomic number, photon absorption, radiation absorption, radiation scattering, radiotherapy, roentgen dose distribution, 727
 - autoradiography, photographic material, history, 3225
 - cancerogenesis, computer program, dose response, radiotherapy, value, 2331
 - cryogenics, neutron radiation, spectrometry, 1014
- nuclear reaction**, fast neutron radiation, frequency of occurrence, 96
- nuclear reactor**, computer, neutron detection, reactivity meter, 1823
 - electricity, candu type reactor, 3565
 - environmental monitoring, ionization chamber, population exposure, thermoluminescence dosimeter, vermont yankee nuclear power station, 1335
 - core catcher system, 2857
- nuclear reactor pressure vessel**, examination, 2855
 - inspection, remote controlled ultrasonic inspection, 2856
- nuclear waste**, environment, soil pollution, 2394
- nurse**, ambulatory care, computer, medical record, 837
 - computer, drug, drug cost, drug prescription, hospital, pharmacy, physician, ctl modular 1 computer, 3049
 - coronary care unit, heart arrhythmia, monitoring, decentralized electrocardiographic display, 2290
- nursing**, bed, electro pneumatic high low bed, 3003
 - bed, patient care, sand bed, 605
 - computer, general practice, health center, health visitor, information processing, medical record, public health service, social worker, real time management, great britain, 840
 - lifting effort, sliding cushion, 1107
 - physical disability, personal lifts, 277
- nursing home**, computer model, hospital management, mathematic model, marker chain model, 1150
- nutrient**, body weight, casein, mathematic model, rat, 13
 - caloric intake, computer, nutrition, protein, intake estimation, 842
- nutrition**, caloric intake, computer, nutrient, protein, intake estimation, 842
 - chemical kinetics, computer model, molecular structure, chemoton, 610
- nutritional habit**, SEE nutrition
- nylon**, acetal, biocompatibility, cell culture, cytotoxicity, plastic, polyethylene, polystyrene, polyurethan, silastic, teflon, testing, 866
- nystagmus**, computer, electronystagmography, data processing, 1163
 - electronystagmography, mathematic model, vestibuloocular reflex, physiological vs pathological conditions, 3135
 - eye movement, mathematic model, saccadic eye movement, 2477
- nystatin**, elasticity, erythrocyte membrane, elastic area, compressibility, 2797

- obesity**, body weight, computer, medical record, medical condition evaluation, 13110 examinations, 3848
 - monitoring, motor activity, small animals, mouse, 676
- obstetric anesthesia**, anesthetic equipment, portable apparatus, 1546
- obstetrics**, computer, medical record, perinatology, statistics, 370
- occipital cortex**, astrocytoma, computer assisted tomography, corpus callosum tumor, evoked visual response, optic radiation, 51 yr old man, necropsy, histopathology, 3724
- occlusion**, hysteroscopy, implantation, uterine tube, uterus, steerable hysteroscope, transcervical occlusion, 1063
- occupational deafness**, auditory recruitment, hearing aid, speech intelligibility, protective hearing aid, 1102
- occupational exposure**, air, environmental monitoring, radioactive contamination, radon 222 daughter, workroom air, working level, 2904
 - personnel radiation monitoring, tritium, tritium surface monitor, 1338
- occupational health**, bioengineering, ergonomics, industry, work environment, manual labor, uk, overview, 2653
 - electromagnetic radiation, industrial medicine, microwave radiation, radiation hazard, 3659
 - environment, microwave radiation, radar, radiation hazard, radiation sources, 3660
- occupational safety**, aerosol, air sampling, protective equipment, personal sampling pumps review, 3748
 - industrial medicine, law, policy, united states, osha sanctions, effectiveness, decision theory, decision models, 3751
- occupational therapist**, biofeedback, myoelectric control, orthotics, prosthesis, 1113
- oculomotor nerve**, extraocular muscle, eye movement, system analysis, saccadic eye movement, 883
 - mathematic model, oscillation, vestibular system, vision, visual acuity, control task, performance, 3515
- oculomotor paralysis**, brain tumor, eye movement, malignant exophthalmos, muscle disease, myasthenia gravis, 118 cases, micromovement recording device, 270
- ocuser**, artificial tear, cornea epithelium, tear, tear film, 2991
- odor**, air pollution, hospital, olfactometry, emission analysis, 992
 - aversion therapy, behavior disorder, generator, smelling, olfactory procedure, new apparatus, 244
- oil mist**, electric field, vacuum, mist precipitator, 153
- olfactometry**, air pollution, hospital, odor, emission analysis, 992
- olfactory bulb**, computer, diving, electroencephalography, caiman, analysis, 1168
- olivocochlear tract**, brain depth stimulation, cochlea microphonic potential, summing, guinea pig, 2617
- olivopontocerebellar atrophy**, computer assisted tomography, evoked acoustic nerve response, 3 cases, method, 3820
- omentum**, computer assisted tomography, diaphragm hernia, mediastinum mass, mediastinum tumor, omentum hernia, case report, 1207
- omphalocele**, gastroschisis, pneumatic reduction device, description of technique, 3684
- oogenesis**, caffeine, calcium, cell membrane, egg, methyladenine, theobromine, theophylline, hormone surface interaction, scanning electron microscopy, starfish, 3716
- open angle glaucoma**, age, closed angle glaucoma, computer, glaucoma, prevalence, 1231
- open heart surgery**, anesthetic agent, blood chemistry, blood pressure, computer, electroencephalography, monitoring, temperature, patient monitoring system, 350
 - atelectasis, postoperative care, spirometry, incentive spirometer, bartlett edwards spirometer, prevention, 1868
 - dye dilution curve, heart output, monitoring, thermodilution, 633
- operating room**, air pollution, anesthetic gas, automotive exhaust, workroom air, scavenging system, 1932
 - anesthesia, cost, heart arrest, lung function, medical record, monitoring, techniques, requirement, 3032
 - anesthesiology, automotive exhaust, hospital, scavenging system, mechanical aspects, 3393
 - anesthesiologist, heart rate, hospital personnel, mental load, stress, telemetry, 525
 - asepsis, divided responsibility, 200
 - automotive exhaust, scavenging system, 745
 - burn, electrocardiography, electrode, monitoring, 3033
 - coronary care unit, electric accident, emergency ward, hospital, intensive care, labor room, recovery room, safety, maryland lutheran hospital, 502
 - electric accident, explosion, survey, 102
 - monitoring, telemetry, 4 channels, 750
 - cardiff aldavac, scavenging system, exhaust gases, 1137
- operating table**, ear surgery, guinea pig, 3399
- operational amplifier**, active filter, 514
 - active filter, notch filter, 112
 - amplifier, current amplifier, impedance converter, 1352
 - sine wave generator, 2490
- ophthalmic artery**, dynamography, ophthalmodynamography, temporal artery, basic principles, methods, monograph, 251
 - intraocular pressure, tonography, new instrument, 3269
 - ophthalmodynamography, ophthalmodynamometry, method, 2636
- ophthalmodynamography**, dynamography, ophthalmic artery, temporal artery, basic principles, methods,

- monograph, 251
- ophthalmic artery, ophthalmodynamometry, method, 2636
- ophthalmodynamometry**, fiberoscope, new device, 1096
- ophthalmic artery, ophthalmodynamography, method, 2636
- ophthalmology**, aerospace medicine, aviation, vision, visual field, space studying device, flight simulation, 3368
- aqueous humor, intraocular pressure, minicomputer, xenon 133, pdp 8 e, cat, 3481
- brain angiography, brain tumor, computer assisted tomography, hypophysis tumor, parasellar tumor, pneumoencephalography, sella turcica tumor, false negative diagnosis, 4 cases, 818
- computer, information processing, programmed system, 1152
- computer, information processing, mini and micro computers, automatic perimetry, 1560
- ophthalmoplegia**, blindness, computer assisted tomography, epiphora, exophthalmos, headache, mucocoele, paranasal sinus, ptosis, 4 cases, 2737
- ophthalmoscopy**, evoked cortical response, evoked visual response, retina macula degeneration, retina pigment degeneration, stroboscopy, retina macula scar, stimulator ophthalmoscope, 47 patients, 2620
- evoked visual response, focal illumination, retina, retina illumination, hand-held and two channel stimulator, new device, 2244
- eye fundus, eye photography, monochromatic light, normal fundus, 2635
- eye photography, fiberoscope, transscleral illumination, 1093
- indirect ophthalmoscopy, television, videorecording, 2253
- indirect ophthalmoscopy, small pupil ophthalmoscope, 2997
- optical lens**, image processing, radiography, scintigraphy, fresnel zone plate, 2512
- light, visual distortion, displaying distortion, 3639
- optic chiasm**, crossing over, deoxyribonucleic acid, deoxyribonucleic acid strand, mathematic model, four strand model, interference, 2787
- optic density**, computer, tooth radiography, 2354
- optic disk**, comparator, glaucoma, stereophotography, new device, 3733
- computer, optic disk cup, 226 healthy subjects, 846
- optic disk cup**, computer, optic disk, 226 healthy subjects, 846
- eye, glaucoma, stereophotography, fundus, 126
- optic filter**, interference filter, alas filter, gaas filter, 172
- ultraviolet radiation, liquid filter, 1411
- optic nerve**, brain tomography, computer assisted tomography, meningioma, visual field defect, woman of 44, 1586
- brain white matter, computer assisted tomography, demyelination, multiple sclerosis, 100 cases, diagnosis, 3829
- nerve section, retractor, nerve viewing and sectioning, rat, 667
- optic nerve coloboma**, echooculography, exophthalmos, melanocytoma, retinoblastoma, vitreous body hemorrhage, new equipment, manual compound scanning, 1100
- optic nerve fiber**, fiberoscope, review, 567
- optic radiation**, astrocytoma, computer assisted tomography, corpus callosum tumor, evoked visual response, occipital cortex, 51 yr old man, necropsy, histopathology, 3724
- optics**, computer model, eye, geometrical optics, ray tracing, 1289
- optoelectronic transducer**, amplifier, electrocardiography, electroencephalography, electromyography, 2099
- mandible, mastication, jaw movement, recording of movements, 1032
- telemetry, calibration, 35
- optokinetic nystagmus**, electronystagmography, microprocessor, vestibular nystagmus, 2000
- model, vestibular nucleus, vestibular nystagmus, 2036
- optometry**, accommodation, infrared radiation, microvariation recording, infrared optometer, 2246
- binocular vision, new device for testing, 1898
- eye movement, infrared radiation, eyetracking, 2637
- refraction, automatic device, 400 eyes, 681
- vision, visual stimulation, 3 d visual stimulation, 2499
- version of badal, 173
- oral biopsy**, computer, data base, education, gingiva, tooth care, oral biopsy data, 8 dental schools, usa, 3471
- orbit**, computer assisted tomography, superior ophthalmic vein, high resolution tomography, 200 cases, 1606
- computer assisted tomography, eye foreign body, foreign body localization, perforating eye injury, 8 cases, 794
- computer assisted tomography, face, paranasal sinus, skull, coronal section, 35 cases, 2729
- computer assisted tomography, orbit tumor, tomography, 213 cases, 1189
- computer assisted tomography, craniopharyngioma, exophthalmos, hemianopia, subarachnoid cyst, boy of 7, 2738
- orbital cortex**, evoked cortical response, splanchnic nerve, tibial nerve, vagus nerve, nerve stimulation, cat, 2973

- orbit cancer**, computer assisted tomography, echooculography, hyperthyroidism, neuropathy, orbit nerve, orbit tumor, 144 cases, 1221
- orbit nerve**, computer assisted tomography, echooculography, hyperthyroidism, neuropathy, orbit cancer, orbit tumor, 144 cases, 1221
- orbit radiography**, computer assisted tomography, sagittal tomography, 3 cases, 3437
- orbit tumor**, brain tumor, computer assisted tomography, histographic analysis, 88 tumors, 1213
 - computer assisted tomography, skull base tumor, whole body scanner indication, 2696
 - computer assisted tomography, orbit, tomography, 213 cases, 1189
 - computer assisted tomography, echooculography, hyperthyroidism, neuropathy, orbit cancer, orbit nerve, 144 cases, 1221
 - computer assisted tomography, exophthalmos, eye foreign body, lens luxation, retinoblastoma, 33 cases, 2742
 - computer assisted tomography, intraorbital foreign body, coronal tomography, 29 cases, 3436
- organ**, autopsy, cancerogenesis, cancer research, computer, data base, mouse strain, pathology, national center for toxicological research, usa, automated pathology information system, 1158
- organic compound**, computer, drinking water, mass spectrometry, surface water, water pollution, united states, trace analysis, 3796
- organic psychosis**, computer assisted tomography, electroencephalography, psychosis, 12 children, 3446
- organogenesis**, brain malformation, brain tumor, computer assisted tomography, congenital malformation, histogenesis, skull defect, computed tomography, indication, 1223
- orienting reflex**, habituation, skin conductance, 2618
- orthodontics**, dentistry, force measurement, 2919
- orthopedics**, body cast, prosthesis, seat, wheelchair, body cast vacuum form method, 280
- orthopedic surgery**, biomechanics, bone, cortical bone, bone pin connection, 3136
 - cryogenics, dentistry, mouth surgery, instrument, 328
- orthosis**, biomechanics, 285
 - cerebral palsy, electrostimulation, hemiplegia, movement, paralysis, actual situation, problem, 713
 - elbow, polypropylene, flail elbow orthosis, 70 yr old woman, 1119
 - electrostimulation, minicomputer, neuromuscular disease, peroneus nerve paralysis, design methodology, 1239
 - knee, polypropylene, hinged orthosis, 2999
 - leg, splint, weight bearing, 1320 mechanics, 3001
 - leg, splint, total hip prosthesis, case report, 3000
- orthotics**, biofeedback, myoelectric control, occupational therapist, prosthesis, 1113
 - handicapped child, meningomyelocele, mobility, standing, 3002
- oscillation**, echocardiography, heart sound, phonocardiography, water hammer, theory, 2214
 - elasticity, flow, tube, collapsible tube, 1705
 - mathematic model, oculomotor nerve, vestibular system, vision, visual acuity, control task, performance, 3515
 - mathematic model, protein synthesis, series expansion, 2396
 - mathematic model, rotation, vestibular system, phase characteristic, phase lead, 3133
- oscilloscope**, camera, photography, frame numbering device, 533
 - digital computer, minicomputer, signal processing, 3228
 - display system, kymography, photography, frame identification, 2487
 - electron microscopy, sampling, scanning electron microscopy, 3594
 - pulse, timer, pulse stretcher, 548
 - recording, sweep generator, logarithmic time base, 2866
- osmium 191**, generator, iridium 191m, scintiangiocardiography, improved generator, ir 191m application in monkey, 1333
- osmotic pressure**, cell membrane, ion transport, mathematic model, membrane, thermodynamics, 2437
 - cell membrane, ion transport, mathematic model, membrane, thermodynamics, 2436
 - cell membrane permeability, epithelial cell, hydrostatic pressure, kidney tubule, 387
 - epithelium, intestine mucosa, intestine potential, intestine serosa, asymmetrical behavior, rat, 1441
- osteomyelitis**, femur, femur neck pin, pseudarthrosis, 31 cases, interlocking nail, 3741
- osteon**, bone piezoelectric potential, piezoelectricity, skull, 2067
 - collagen, cortical bone, mathematic model, piezoelectricity, stress frequency, 80
- osteoporosis**, bone reconstruction, long bone, osteosynthesis, internal fixation plate, interdisciplinary approach, 886
- osteosynthesis**, ankle, fracture external fixation, joint mobility, physiotherapy, rehabilitation, talipes equinus, tibia fracture, foot movement plate, 3742
 - arthritis, biomechanics, patella fracture, 116 cases, 1262
 - biomechanics, bone infection, fracture, fracture external fixation, survey, 1109
 - bone compression, bone plate, bagley bone plate, case series, a self compressing bone plate, 3744
 - bone reconstruction, long bone, osteoporosis, internal fixation plate, interdisciplinary approach, 886

- femur fracture, fracture healing, finite element analysis, fixation device, 3132
- model, evaluation, fixation plate, finite element, 1265
- osteotomy**, bone, sawing, ultrasonics, welding, surgery, autopsy, rabbits, 1018
 - femur greater trochanter, methacrylic acid methyl ester, total hip prosthesis, surgical technique, carbide drills, prosthesis extraction, 2383
 - nose reconstruction, nose surgery, double chisel, new instrument, 3037
- otitis media**, brain angiography, brain falx, computer assisted tomography, epidural abscess, subdural empyema, 11 yr old girl, neurosurgery, interhemispheric localization, 3062
 - tympanostomy tube, spoon bobbin drain tube, 1892
- otolith**, cupula, mathematic model, semicircular canal, sensation interaction, 436
- otorhinolaryngology**, computer assisted tomography, nose cavity, paranasal sinus, pons angle, applications, 9
 - selected cases, 2719
 - medical literature, medical record, simplified filing system, 3469
- otoscopy**, photography, storz otophotography equipment, 3340
- ouabain**, adenosine triphosphatase, amnesia, cycloheximide, lithium chloride, memory, phenytoin, potassium chloride, protein synthesis, sodium pump, 3 phase model, 241
 - lens potential, potassium, temperature, oil chamber, bovine lens, asymmetry potential, 2243
- outpatient**, anesthetic recovery, stabilography, measurement, 3394
 - ectopic beat, electrocardiography, heart arrhythmia, monitoring, 2294
- outpatient department**, case finding, medical record, multiphasic testing, multiphasic screening group, chart abstract group, chart review group, comparisons, 835
- oven**, thermostat, 3615
- oxacillin**, antibiotic agent, bone cement, poly(methacrylic acid methyl ester), high pressure insertion, 2
- oxidation reduction reaction**, electrode, electrode impedance, review, 2540
- oxidative phosphorylation**, benzimidazole derivative, cell membrane, mathematic model, mitochondria, in vitro, model study, 2764
- oximetry**, catheter, infrared radiation, oxygen, photometry, 1395
 - cuvette, hemoglobin, photometry, wedge cuvette, 2141
 - fiberoscope, heart catheterization, oxygen blood level, oxygen saturation, design, 1812
 - fiberoscope, heart catheterization, photometry, 3240
 - infrared radiation, light, 2588
 - retina, rabbit, 1375
- oxygen**, assisted circulation, forward heart failure, heart output, external counter pulsator, 636
 - blood rheology, carbon dioxide, gas diffusion, hemoglobin, mathematic model, ph, 1307
 - carbon dioxide, carbon monoxide, fluoride, gas diffusion, helium, lung diffusion, mathematic model, binary diffusion coefficient, 2828
 - carbon dioxide, gas, gas chromatography, nitrogen, scholander method, 1394
 - catheter, infrared radiation, oximetry, photometry, 1395
 - diffusion, hemoglobin, myoglobin, facilitated diffusion, 466
 - environment, water pollution, 1652
 - equation, gas bubble, lung diffusion, neon, nitrogen, respiration, counter diffusion, 2051
 - gas diffusion, gas mixing, helium, nitrogen, water vapor, binary and ternary diffusion, 1295
 - lung ventilation, oxygen consumption, on line measurements, 1813
 - mathematic model, oxygen electrode, transfer coefficient, 1004
- oxygen 15**, SEE oxygen isotope
- oxygenation**, blood, silastic, tube, complex geometry, helical coil, 629
- oxygenator**, arteriovenous shunt, biocompatibility, blood clotting, polysiloxane, silastic, thrombocyte count, lamb, 1869
 - carbon dioxide, extracorporeal circulation, extrapulmonary oxygenation, lung ventilation, sheep, 322
 - extracorporeal circulation, gas embolism, nitrogen, possible contra indication, 1481
 - oxygen consumption, analysis methods comparison, 3306
 - spiral membrane, 650
- oxygen blood level**, arteriovenous oxygen difference, hemoglobin, spectrophotometry, flowing whole blood esophagus, 1002
 - fiberoscope, heart catheterization, oximetry, oxygen saturation, design, 1812
- oxygen breathing**, accident, burn, catheter, fire risk, nasogastric tube, case, 229
- oxygen consumption**, anesthesia, monitoring, nitrous oxide, surgery, oxygen measurement, 1934
 - basal metabolic rate, accuracy of measurement method, 2915
 - bicycle ergometry, calculation, heart function test, step test, cylinder, 646
 - blood flow, erythrocyte, tube, turbulent flow, 1702
 - blood pressure, exercise, heart rate, heart work, rest, automatic measurement, 2753
 - brain, computer model, nonlinear system, 2627
 - breathing, energy expenditure, energy transfer, mathematic model, calculation, 3681
 - calorimetry, energy transfer, 24 hrs, direct and indirect measurement, 3635

- carbon dioxide, evaporation, respiration quotient, water loss, water loss measurement, bird, lizard, 206
- computer, electrocardiography, exercise, heart rate, lung function, tidal volume, breath-by-breath respiratory measurements, 1615
- computer assisted tomography, echocardiography, exercise, heart catheterization, phonocardiography, invasive and noninvasive evaluation, human subject, 3416
- diaphragm, polarography, high sensitivity device, rat, 1832
- exercise, gas exchange, heart output, output determination, 2201
- fetus, hypoxia, mathematic model, placenta, uterus contraction, 205
- gait, leg brace, rehabilitation, spinal cord injury, spinal cord transverse lesion, walking, 3 cases, pneumatic orthosis, 289
- lung function, oxygen electrode, respiration, telemetry, transducer, 2106
- lung ventilation, oxygen, on line measurements, 1813
- oxygenator, analysis methods comparison, 3306
- measuring method, crab, 2892
- oxygen electrode**, blood oxygen tension, countercurrent multiplier system, gas, mathematic model, swimming device, experimental model verification, eel, 914
 - brain cortex, brain oxygen tension, discrete brain cortex volume, rabbit, 1003
 - electroencephalography, electroretinography, microelectrode, nerve cell potential, platinum electrode, double barrelled electrode, simultaneous measurement, 2142
 - lung function, oxygen consumption, respiration, telemetry, transducer, 2106
 - mathematic model, nonuniform diffusion model, 566
 - mathematic model, oxygen, transfer coefficient, 1004
 - oxygen tension, determination, 552
 - pulsed oxygen cathode design, 2140
- oxygen isotope**, fast proton radiation, radiation beam, beam localization, 3251
 - muscle water, nuclear magnetic resonance, sartorius muscle, transverse longitudinal resonance, frog, 3201
 - proton radiation, localization test, 590
- oxygen saturation**, calculator, oxygen tension, 1159
 - fiberoscope, heart catheterization, oximetry, oxygen blood level, design, 1812
- oxygen tension**, antimony, bicarbonate, buffer, carbon dioxide, carbon dioxide tension, hydrogen ion, microelectrode, antimony microelectrode, 165
 - brain blood flow, carbon dioxide tension, mathematic model, 470
 - calculator, oxygen saturation, 1159
 - magnetic field, tissue, oxygen movement, 2829
 - oxygen electrode, determination, 552
- oxygen tension electrode**, arterial carbon dioxide tension, arterial oxygen tension, carbon dioxide electrode, mass spectrometry, venous oxygen tension, continuous measurement, 3632
 - arterial oxygen tension, monitoring, newborn, skin oxygen tension, 3633
 - electrode paste, gold, thin film electrode, 2891
- oxygen transport**, biological model, computer model, model, 2451
 - capillary, capillary flow, erythrocyte, mathematic model, 461
- oxyhemoglobin**, magnetic field, iron electronic state, human, 214
- pacemaker**, cell membrane, diving, heart rate, hydrostatic pressure, nerve cell, mouse, rat, guinea pig, rabbit, dog, 3692
- pacemaker nerve cell**, calcium, mathematic model, nerve cell membrane conductance, 3554
 - fat, model, potassium channel, semiconductor, tetrodotoxin, 926
 - hodgkin huxley equation, phase control, 1730
- pad**, semicircular canal, vestibular system, computer, impulse weight function, frog, 3356
- pain**, acupuncture, hypnosis, signal detection theory, 12 volunteers, report criterion, 1079
 - biofeedback, medical instrumentation, placebo, placebo effect, 1887
 - electrostimulation, pain threshold, apparatus, 22 volunteers, pain tolerance, skin stimulation, 1488
 - electrostimulator, skin, skin defect, 694
 - herpes zoster, nerve stimulation, neuralgia, phantom pain, thalamus, 46 cases, electrode placement, 249
 - nerve potential, sensory nerve, tooth, recording method, 674
- paint**, photometry, reflectance, 1407
- pain threshold**, electrostimulation, pain, apparatus, 22 volunteers, pain tolerance, skin stimulation, 1488
- pancreas**, computer assisted tomography, echography, kidney, spleen, differential diagnosis, case report, 3817
 - computer assisted tomography, survey, 3448
 - computer assisted tomography, liver, thorax, 354
 - computer assisted tomography, survey, 3069
- pancreas cancer**, acute pancreatitis, chronic pancreatitis, computer assisted tomography, 121 cases, 820
- pancreas carcinoma**, abdominal radiography, computer assisted tomography, 574 cases, 1180

pancreas disease, computer assisted tomography, hepatography, liver cancer, liver cyst, 120 cases, whole body tomography, 831

- computer assisted tomography, endoscopic retrograde cholangiopancreatography, kidney disease, liver disease, liver scintiscanning, retroperitoneal disease, tomography, 359

pancreas pseudocyst, computer assisted tomography, echography, malignant fibrous histiocytoma, diagnosis of homogeneous mass, histopathology, 1186

pancreas tumor, computer assisted tomography, cystadenoma, case report, 3464

pancreatopeptidase e, carotid artery, clostridiopeptidase a, elasticity, hyaluronidase, iodoacetate sodium, model, noradrenalin, sodium cyanide, maxwell model, voigt model, 1656

panting, body temperature, breathing work, compartment model, lung ventilation perfusion ratio, respiration control, thermoregulation, dog, 1699

papaverine, blood vessel resistance, muscle blood flow, sympathectomy, vasodilatation, rate sensitivity regulation, cat, 645

parachutist, airplane pilot, biodynamics, mathematic model, model, ucin crash victim simulation code, wind loading effect, 3364

paralysis, anxiety, biofeedback, electromyography, epilepsy, insomnia, spasticity, tension headache, clinical application, review, 1081

- cerebral palsy, electrostimulation, hemiplegia, movement, orthosis, actual situation, problem, 713

paramagnetic resonance, cryogenics, microwave radiation, microwave coupler, 186

paramedical education, education, hospital, medical engineering, internship approach, 2382

- education, hospital, medical engineering, usa, 2381
- medical instrumentation, public health service, technician, 382

parameter, algorithm, correlation function, factorial analysis, matrix analysis, 3511

parameter extraction, averaging, electroencephalography, signal processing, 1753

- blood flow, circulation, heart left ventricle, hemodynamics, mathematic model, 469
- compartment model, computer model, 2786
- computer program, statistics, 688
- electroencephalography, rem sleep, sleep, time series, automatic classification, 1951
- hearing, loudness discrimination, spectrometry, model, 910

paranasal sinus, blindness, computer assisted tomography, epiphora, exophthalmos, headache, mucocoele, ophthalmoplegia, ptosis, 4 cases, 2737

- computer assisted tomography, face, orbit, skull, coronal section, 35 cases, 2729
- computer assisted tomography, face, mucocoele, rhinopharynx cancer, skeleton, 1962
- computer assisted tomography, nose cavity, otorhinolaryngology, pons angle, applications, 9 selected cases, 2719

paraplegia, bladder, bladder pacemaker, electrode, implant, micturition, quadriplegia, spinal cord injury, urethra, baboon, 1486

- table, 290

parasellar tumor, brain angiography, brain tumor, computer assisted tomography, hypophysis tumor, ophthalmology, pneumoencephalography, sella turcica tumor, false negative diagnosis, 4 cases, 818

- computer assisted tomography, hypophysis adenoma, sella turcica, empty sella, 1188

parathyroid adenoma, computer assisted tomography, hyperparathyroidism, mediastinum, neck, 10 cases, 797

parathyroid gland, computer, parathyroid scintiscanning, pertechnetic acid tc 99m, radium, scintiscanning, toluidine blue i 131, preoperative localization, 3440

parathyroid scintiscanning, computer, parathyroid gland, pertechnetic acid tc 99m, radium, scintiscanning, toluidine blue i 131, preoperative localization, 3440

parenteral feeding, computer program, newborn surgery, 844

parenthood, computer assisted diagnosis, computer program, diagnosis, genetic polymorphism, paternity, 3419

parkinson disease, acceleration, telemetry, tremor, 40 patients, 523

- alcoholism, alzheimer disease, brain atrophy, computer assisted tomography, dementia, multiple sclerosis, progressive multifocal leukoencephalopathy, schilder disease, survey, 358
- capacitance transducer, tremor, measuring device, variable, 2963

parkinsonism, computer, differential diagnosis, display system, hand, information processing, tremor, 1240

partial epilepsy, age, brain cortex, computer assisted tomography, hemianopia, hemiparesis, temporal lobe epilepsy, 11 out of 500 children, 788

- brain atrophy, brain calcification, brain ischemia, brain tomography, brain tumor, computer assisted tomography, electroencephalography, porencephaly, 200 cases, 787
- brain atrophy, central nervous system metastasis, computer assisted tomography, electroencephalography, encephalitis, epilepsy, tonic clonic epilepsy, 99 cases, 829

particle counter, aerosol, dust, industrial hygiene, portable optical counter system, 3413

- electronic particle counting, 15-1000 mum in diameter, 3625

particulate matter, dust, respiratory tract, fine particle deposition, theoretical model, 3711

parylene, insulator, microelectrode, 1501

patella fracture, arthritis, biomechanics, osteosynthesis, 116 cases, 1262

- patellofemoral joint**, elasticity, knee, viscosity, contact study, 1114
- paternity**, computer assisted diagnosis, computer program, diagnosis, genetic polymorphism, parenthood, 341
- pathology**, automation, disease classification, index, medical record, snop vs icd, 2744
- autopsy, cancerogenesis, cancer research, computer, data base, mouse strain, organ, national center for toxicological research, usa, automated pathology information system, 1158
 - breast biopsy, computer, data base, diagnosis, mammography, radiography, interclinical cross check, 708 cases, austria, 3430
 - cardiology, data base, histopathology, information processing, respiration, ssis, 3087
 - classification, coding, diagnosis, index, medical record, german, 341
- pathophysiology**, computer, mathematic model, 406
- computer, heart transplantation, information processing, canada, phocar system, 3851
- patient**, computer, hospital management, real time; london hospital project, 2687
- patient care**, administration, finance, minicomputer, medium scale computer converting to mini, 2875
- bed, nursing, sand bed, 605
 - computer, health care delivery, library, medical documentation, public health service, patient care, literature coordination, 2695
 - medical record, microfilm, 340
- patient identification**, radiology, system, 3016
- pattern recognition**, adverse drug reaction, drug monitoring, epidemiology, mathematic model, pharmacokinetics, public health, 1956
- aorta subvalvular stenosis, cardiography, computer, echography, mitral valve prolapse, mitral valve stenosis, 3102
 - auditory masking, hearing, sound burst, 264
 - auditory masking, hearing, signal noise ratio, pure tone, 2820
 - aviation, graphology, image processing, photography, 1695
 - blindness, touch, visual aid, 'tactile' vision, 697
 - camera, image processing, 3589
 - camera, space variant pattern, 3226
 - cell, cytology, mathematic model, uterine cervix cytology, 2509
 - cell motion, mathematic model, markov model, 884
 - cell nucleus, computer analysis, endometrium carcinoma, endometrium hyperplasia, quantitative microscopy, 2956
 - cell shape, computer analysis, image display, microscopic image, interactive measurements, program system, 2298
 - cell shape, computer analysis, software system, pdp12 computer, 3407
 - cerebellum cortex, memory, music, nerve cell network, purkinje cell, d neuronal network, 1732
 - character recognition, reading aid, hand printing, 3739
 - character recognition, reading aid, hand printing, 3738
 - character recognition, reading aid, handwriting, 3737
 - chemical kinetics, computer model, diffusion, activator inhibitor, 2397
 - chromosome analysis, computer analysis, karyotyping, computer assisted analysis, 2302
 - computer, drug analysis, mass spectrometry, pharmacology, structure activity relation, 3092
 - computer assisted tomography, image processing, shape discrimination, circle transform, 2339
 - correlation function, holography, optical correlation, 1784
 - counter, leukocyte, television, hematrak differential counter, 628
 - curve tracer, graphology, 2023
 - cytology, fourier transform, image processing, microscopy, 3596
 - decision, reading aid, statistics, character recognition, 531
 - diagnosis, electromyography, gait, locomotion, 19 patients, 1906
 - diarrhea, epidemic, mathematic model, 139 infants, 2781
 - digital computer, line figure, 2527
 - digital computer, information processing, speech, speech frequency, 63
 - digital computer, electroencephalography, adaptive segmentation, 1952
 - digital computer, vision, 2449
 - electron microscopy, erythrocyte, 2017
 - fluorescence, mathematic model, system identification, moments, 2895
 - fourier transform, image processing, microscopy, mellin transfer, 1008
 - fourier transform, image processing, shape discrimination, 1777
 - learning, mathematic model, memory, nerve cell network, potassium channel, sodium channel, synapse, 1316
 - mathematic model, vision, visual adaptation, spatial filtering, local adaptation, 1290
 - model, vision, visual acuity, 2049
 - phonocardiography, linear prediction analysis, 1848
 - regression, speech, speaker independent recognition, 2869

- signal noise ratio, distorted pattern, 1776
- sound, optic method, 1684
- statistics, 32
- vision, feature relation, 1689
- vision, visual discrimination, form discrimination, 1293
- vocalization, automatic recognition, monkey, 1999
- classification, 2526
- law edema**, carrageen, inflammation, salicylic acid, edema measurement method, rat, 3679
- leltier effect**, brain cortex, cooling, thermode, local cooling, 2974
 - cooling system, heater, temperature control, dc proportional temperature controller, 2173
- pelvis**, biomechanics, bone, compact bone, hip bone, bone stress evaluation, 3148
 - bladder carcinoma, computer assisted tomography, pelvis cancer, prostate, survey, 3450
- pelvis cancer**, bladder carcinoma, computer assisted tomography, pelvis, prostate, survey, 3450
 - gynecologic cancer, radiotherapy, radiation portal, verification film, 28 cases, 3377
- penthanil**, agriculture, chelating agent, food chain, plant, plutonium 239, radioactive contamination, pu 239 uptake, usa, 95
- penthanil yb 169**, cerebrospinal fluid, computer assisted tomography, hydrocephalus, normotensive hydrocephalus, scintiscintigraphy, subarachnoid hemorrhage, 54 cases, 2721
- perception**, annoyance, community, environmental sanitation, loudness, noise, pollution, loudness scaling, 256
 - cognition, hemisphere, imagination, nerve cell, nerve cell network, visual cortex, visual nerve cell, model, 86
 - contrast, mathematic model, muller lyer illusion, 2047
 - cybernetics, information science, mathematic model, 419
 - electric field, generation, bee, 257
 - electrostimulation, feedback system, median nerve, prosthesis, 2262
 - illusion, law, vision, mathematic model, stability, 3161
 - mathematic model, calibration equation, 873
 - quantum mechanics, neumann theory, 2790
 - quantum mechanics, 3123
- perception deafness**, cochlea, 13 patients, implants, 3728
 - deafness, hearing aid, gain, frequency response, 1090
 - hearing aid, presbycusis, 261 patients, follow up, 1103
 - hearing aid, hearing impairment, frequency converter, 1523
 - hearing aid, speech discrimination, radio frequency clipping, taped speech, 2239
 - hearing impairment, signal noise ratio, speech, speech intelligibility, 1288
- perforating eye injury**, computer assisted tomography, eye foreign body, foreign body localization, orbit, 8 cases, 794
 - electron probe, eye foreign body, eye injury, foreign body localization, roentgen analysis, case report, technique, 2255
- performance**, airplane pilot, model, optimal control pilot vehicle model, roll motion effect, 3367
 - automation, echocardiography, heart left ventricle, ultrasonics, time to voltage analogue, converter, dog, 1455
 - computer, quality control, sport, training, decathlon, model analysis, computer generated scoring tables, 3475
- perfusion**, adsorbent agent, artificial organ, compartment model, fixed bed adsorber, 2059
 - brain, experimental animal, tissue fixation, simple apparatus, whole animals, rodents, brain fixation, pressure control, 1073
- perimetry**, color perimetry, visual field, high luminance, 1896
 - computer, glaucoma, visual field, 2379
 - evoked cortical response, evoked visual response, limitation, 3734
 - visual field, binocular, 1894
 - visual field, autoplots perimeter, instrumentation and technique, 2986
- perinatology**, computer, medical record, obstetrics, statistics, 370
- periodic medical examination**, breast cancer, chronic disease, mammography, mass screening, model, mathematical analysis, transient analysis, screening interval, 1250
 - multiphasic testing, preventive medicine, screening test, principals for application, usa, 604
- periodontal membrane**, mandible, tooth, mechanic behavior, 894
- peripheral occlusive artery disease**, aortography, femoral artery, transaxillary aortography, special catheter, 230 cases, 720
- peritoneal dialysis**, compartment model, creatinine blood level, hemodialysis, mathematic model, urea blood level, uremia, 3169
 - single needle, semicontinuous device, 2221
- peritoneum macrophage**, intracellular potential, mast cell, microelectrode, measurement techniques, mouse, 159
- permeability**, intestine, leg, lung, lymph flow, lymph protein, lymph vessel, mathematic model, reflexion

- coefficient estimation, 1704
- unstirred layer effects, 1320
- peroneus nerve paralysis**, electrostimulation, minicomputer, neuromuscular disease, orthosis, design methodology, 1239
- peroperative cholangiography**, catheter, cholangiography, cystic bile duct, cystic duct catheter clamp, 1035
- personality**, athlete, motivation, psychology, sport, rating scale, coaching, 3474
 - computer model, research, review, 3111
- personnel radiation monitoring**, occupational exposure, tritium, tritium surface monitor, 1338
- pertechnetic acid tc 99m**, brain scintigraphy, brain tumor, computer assisted tomography, comparison, 190 cases, 1183
 - computer, parathyroid gland, parathyroid scintiscanning, radium, scintiscanning, toluidine blue i 131, preoperative localization, 3440
- petit mal**, computer, electrocardiography, spike wave, prolonged recording, on line, 5 cases, 2325
- ph**, blood rheology, carbon dioxide, gas diffusion, hemoglobin, mathematic model, oxygen, 1307
 - cell membrane permeability, chloride, nerve fiber membrane, nerve fiber membrane permeability, nerve fiber membrane steady potential, potassium, sodium, crayfish, 1718
 - liver cell, effect in isolation, rat, 616
- phagocytosis**, chemotaxis, mathematic model, polymorphonuclear granulocyte, markov model, 396
- phantom**, angiography, blood vessel, computer model, 1862
 - beam profile, cancer, cobalt therapy, dosimetry, 3433
 - beta radiation, dosimetry, gamma radiation, radiotherapy, roentgen radiation, tissue equivalent, 2928
 - cat, cobalt therapy, dosimetry, roentgen dose distribution, tissue inhomogeneities, 3432
 - cobalt 60, dosimetry, ionization chamber, gamma radiation, radiotherapy, 3013
 - collimator, scintillation camera, dynamic studies, 305
 - dosimetry, mathematic model, radiation exposure, japanese adult, 99
 - electron, magnetic field, roentgen dose distribution, depth dose, 1419
 - linear energy transfer, neutron radiation, pion radiation, radiotherapy, roentgen dose distribution, 1198
- phantom pain**, herpes zoster, nerve stimulation, neuralgia, pain, thalamus, 46 cases, electrode placement, 249
- pharmacokinetics**, adverse drug reaction, drug monitoring, epidemiology, mathematic model, pattern recognition, public health, 1956
 - ascorbic acid, brain, cerebrospinal fluid, computer, extracellular space, mannitol, model, rabbit, 859
 - bile, bromsulphophthalein, computer model, drug interaction, warfarin, 3498
 - bioavailability, blood cell aggregation, drug clearance, drug metabolism, drug protein binding, enzyme, liver blood flow, mathematic model, review, 3108
 - biopharmaceutics, drug release, gastrointestinal tract, mathematic model, 1627
 - blood, model, simulation of blood level curves, 411
 - cancer, computer program, drug half life, folinate calcium, kidney failure, mathematic model, methotrexate, 5 patients, 3435
 - compartment model, model, linear compartment model, micro constant, 410
 - compartment model, model, linear compartment model, 409
 - compartment model, model, linear compartment model, 408
 - computer, iteration program, 3093
 - digital computer, multiple iteration program, 3476
 - drug absorption, dose law, model, 2385
 - drug administration route, drug half life, mathematic model, 1628
 - drug dose, mathematic model, computer, optimization, method, 1629
 - drug metabolism, drug protein binding, liver disease, mathematic model, review, 21
 - mathematic model, multiple linear regression, numerical algorithm, 2766
 - model, 407
- pharmacology**, computer, drug analysis, mass spectrometry, pattern recognition, structure activity relation, 3092
- pharmacotherapy**, algorithm, cancer chemotherapy, drug dose, hodgkin disease, oncology center, 351
 - clinical study, information processing, medical record, 2750
 - computer, diagnosis, documentation, epidemic, 2329
 - public health service, statistics, 416
- pharmacy**, computer, counting, tablet, bar code recorder, 1984
 - computer, drug, drug cost, drug prescription, hospital, nurse, physician, cti modular 1 computer, 3049
- phase detection**, fluorescence, fluorometry, 3642
 - fourier transform, nuclear magnetic resonance, quadrature phase, 185
- phase lock amplifier**, frequency modulation, telemetry, 1772
- phase modulator**, amplitude modulator, telemetry, 2113
 - frequency modulation, light modulator, 3646
- phase transition**, calorimetry, alternating current, 3617
- ph electrode**, amplifier, automatic balancing amplifier, 1760

- amplifier, implantation, thick film hybrid technology, 2143
- esophagus ph, gastroesophageal reflux, stomach acid, automatic analysis, 1836
- integrated circuit, 2144
- microelectrode, muscle fiber, soleus muscle, mouse, 1005
- semiconductor, review, gas sensor, 144

phenomenology, echolocation, target direction determination, bat, 868

phenytoin, adenosine triphosphatase, amnesia, cycloheximide, lithium chloride, memory, ouabain, potassium chloride, protein synthesis, sodium pump, 3 phase model, 241

pheromone, chemoreceptor, chemotaxis, escherichia coli, physics, 2009

philosophy, cybernetics, feedback system, memory, 2007

ph measurement, differential amplifier, electrometer, 511

- digital computer, process control, errors, 3241

phonation, computer, pitch, pitch extraction, 2752

phonocardiography, aorta valve prosthesis, computer, dysfunction detection, 769

- artery murmur, blood flow, model, stenosis, 1709
- artery murmur, artery occlusion, blood flow, cardiovascular murmur, mathematic model, 1308
- auscultation, heart sound, tape recorder, 2198
- computer assisted tomography, echocardiography, exercise, heart catheterization, oxygen consumption, invasive and noninvasive evaluation, human subject, 3416
- echocardiography, heart sound, oscillation, water hammer, theory, 2214
- echocardiography, mitral valve prosthesis, 15 cases, 1434
- electrocardiography, telemetry, 2931
- heart murmur, technique, 2936
- heart sound, microphone, signal noise ratio, 1058
- pattern recognition, linear prediction analysis, 1848

phosphatidylethanolamine, lecithin, lipid membrane, membrane steady potential, monazomycin, nonactin, phospholipid, valinomycin, antibiotic membrane probe, 1247

phosphatidylinositol, brain, liposome, liver, phospholipid exchange protein, beef, 397

phosphodiesterase, adenylcyclase, computer model, cyclic amp, heart muscle ischemia, hypoxanthine, inosine, noradrenalin, vasodilatation, rat, 2452

phospholipid, computer, fatty acid ester, gas chromatography, mass spectrometry, triglyceride, 3047

- lecithin, lipid membrane, membrane steady potential, monazomycin, nonactin, phosphatidylethanolamine, valinomycin, antibiotic membrane probe, 1247

phospholipid membrane, cell membrane conductance, membrane potential, sarcoplasmic reticulum, 3501

- smelling, frog, 7

photoacoustic spectroscopy, piezoelectricity, signal detection, 3210

photochemistry, beta radiation, brems radiation, evaluation, 589

photochemotherapy, erythema, erythropoietic porphyria, light reactivity, minimum erythema dose, phototest, ultraviolet radiation, new apparatus, application, 3651

photodiode, amplifier, signal noise ratio, 518

- amplifier, signal noise ratio, feedback, 1410
- diffractometer, light diffraction, muscle, muscle contraction, muscle length, sarcomere, sarcomere length determination, 3362
- laser, photometry, 3643

photoelectric cell, circadian rhythm, drinking, recording system, rodent, primates, 1503

- environment, solar energy, 3505
- integrator, photometry, semiconductor, 175
- semiconductor, output recording circuit, 1756
- spectrometry, photocathode, photo multiplier, 105

photoelectric plethysmography, artery, artery pulse, monitoring, reflection photoplethysmography, 1446

photographic material, autoradiography, nuclear radiation, history, 3225

photography, autoradiography, image processing, 535

- aviation, graphology, image processing, pattern recognition, 1695
- behavior, electromyography, head movement, neck muscle, vision, 2638
- camera, oscilloscope, frame numbering device, 533
- computer program, jaw, skeleton, medial axes, algol, 1973
- display system, kymography, oscilloscope, frame identification, 2487
- flow, laser, speckle photography, 2496
- holography, image processing, 132
- image intensifier, radiography, miniaturization, 2281
- image processing, vision, mosaic picture, 1774
- image processing, image quality, 1781
- image processing, radiography, tomography, camera, photographic reconstruction, 3787
- infrared radiation, luminescence, cathodoluminescence, image sensor, 2871

- otoscopy, storz otophotography equipment, 3340
- stereoscopic vision, vision, angle detection, 2438
- photolysis**, anisotropy, retina rod, retina rod outer segment, rhodopsin, frog, 698
 - chemical kinetics, flash lamp, 2561
 - chemical kinetics, resistance, ionization reaction, 558
 - light absorption, mathematic model, 2557
 - matrix isolation study, 3649
- photometry**, anterior eye chamber, tyndall phenomenon, new device, 2555
 - artery, blood pressure, device for contact free recording, 147
 - catheter, infrared radiation, oximetry, oxygen, 1395
 - clinical chemistry, digital computer, enzyme kinetics, spectrometry, zeiss prp, 753
 - computer, photon, 188
 - contour, display system, 739
 - cryostate, enzyme, spectrometry, 2506
 - cuvette, hemoglobin, oximetry, wedge cuvette, 2141
 - digital computer, image processing, stereoscopic vision, vision, 3647
 - ellipsometer, photomultiplier, polarimetry, linearization, drift stabilization, 3650
 - fiberoscope, heart catheterization, oximetry, 3240
 - holography, double beam photometer, serum dna, 1366
 - infrared radiation, light reflection, sulfur, reflection standard, 3490
 - integrator, photoelectric cell, semiconductor, 175
 - ionization meter, synchrotron, ultraviolet radiation, ionization chamber, 1009
 - laser, photoresistor, semiconductor, stannic oxide, 3645
 - laser, photodiode, 3643
 - molecular structure, spectrometry, oscillator strength, double beam monochromator, 170
 - paint, reflectance, 1407
 - photomultiplier, 3648
 - ultraviolet radiation, argon arc standard, 1413
 - spectrally flat response, 1406
- photomultiplier**, ellipsometer, photometry, polarimetry, linearization, drift stabilization, 3650
 - photometry, 3648
 - power supply, inverter, 1398
 - scintigraphy, rca 8850/8575, gain stability, 3573
- photon**, computer, photometry, 188
 - laser, 2 photon effect, 66
 - scintillation counting, 1822
- photon absorption**, atomic number, nuclear radiation, radiation absorption, radiation scattering, radiotherapy, roentgen dose distribution, 727
 - bone, gadolinium 153, proportional counter, xenon filled multiwire counter, 2095
 - bone mineral, computer assisted tomography, dual energy tomography, 3445
- photon scanning**, compton effect, densitometry, tissue densitometry, 3383
- photoreceptor**, calcium, illumination, visual cell, activity change, cattle, 458
 - dark adaptation, light adaptation, ventral photoreceptor, limulus, 3735
 - information processing, luminance, mathematic model, night vision, visual field, 3537
 - mathematic model, system identification, quasi white random signals, calliphora, 1692
 - model, nerve cell, postsynaptic receptor, presynaptic receptor, retina, synapse transmission, 2844
 - visual acuity, voltage signal, turtle, 911
- photoresistor**, laser, photometry, semiconductor, stannic oxide, 3645
- photostimulation**, beta carotene, cellulose derivative, lecithin, membrane potential, retinal isomer, 3156
 - critical flicker fusion, vision, sinusoidal stimulator, 1105
 - electroretinography, light, light intensity, an instrument for standardization, 2252
 - evoked cortical response, evoked visual response, hysteresis, mathematic model, 2464
- photosynthesis**, chlorophyll, laser, methylpheophorbide a, pheophetin a, 167
 - chloroplast, computer model, translocator, kinetic model, 402
- phototest**, erythema, erythropoietic porphyria, light reactivity, minimum erythema dose, photochemotherapy, ultraviolet radiation, new apparatus, application, 3651
- physical disability**, car driving, prescription, 274
 - car driving, medical examination, 3369
 - communication, electronic device, 2639
 - mental deficiency, wheelchair, prescription, 286
 - nursing, personal lifts, 277
 - telephone, electronic dialing device, 2640
 - walking aid, automatic elevator, 3360
- physician**, antihypertensive agent, computer, hypertension, prospective controlled study, 116 patients, 849

- computer, cost, electrocardiography, monitoring, safety, over and underutilization, contribution to diagnosis, task force, 2701
- computer, drug, drug cost, drug prescription, hospital, nurse, pharmacy, ctl modular 1 computer, 3049
- computer, doctor patient relation, quality control, 2683
- physiologic optics**, lens, fish lens in a spider, 67
- physiology**, cassette recorder, electrocardiography, electroencephalography, plethysmography, sexual arousal, sexuality, vagina, vaginal photoplethysmography, cassette recorder, 1883
 - ranking test, statistics, 2013
- physiotherapy**, ankle, fracture external fixation, joint mobility, osteosynthesis, rehabilitation, talipes equinus, tibia fracture, foot movement plate, 3742
 - diathermy, electromagnetic field, electromagnetic radiation, hyperthermia, microwave radiation, 2178
 - diathermy, electromagnetic radiation, radiation absorption, penetration depth, 1909
- phytanic acid**, lipid, lipid membrane, capacity, membrane capacity capacity, 3547
- piezoelectricity**, bone disease, bone stress, magnetic field, recording, non invasive method, 3005
 - bone piezoelectric potential, collagen, mathematic model, stress generated potential, 79
 - bone piezoelectric potential, mathematic model, bent long bone, 2068
 - bone piezoelectric potential, osteon, skull, 2067
 - collagen, cortical bone, mathematic model, osteon, stress frequency, 80
 - crystal, powder, demonstration device, 161
 - photoacoustic spectroscopy, signal detection, 3210
 - transducer, 3571
 - transducer, distortion, 508
- piezoelectric transducer**, biting pressure, force transducer, volunteers, 507
 - transducer, response optimization, correcting circuit, 950
 - parallel movement, 106
- pineal body**, brain tumor, computer assisted tomography, pinealoma, 8 cases, classification, 2732
- pinealoma**, brain tumor, computer assisted tomography, pineal body, 8 cases, classification, 2732
- pinocytosis**, cell membrane, endothelium cell, mathematic model, vesicular transport, 18
- pion radiation**, beam profile, cancer, radiotherapy, roentgen dose distribution, 3431
 - beam profile, dosimetry, radiotherapy, 3372
 - linear energy transfer, neutron radiation, phantom, radiotherapy, roentgen dose distribution, 1198
- pipet**, blood pressure meter, micropipette, 1472
- pitch**, algorithm, speech, evaluation, 906
 - computer, phonation, pitch extraction, 2752
 - evoked acoustic nerve response, spectroscopy, frequency following response, harmonics, 2979
 - hearing, loudness, mathematic model, 2824
 - hearing, speech, speech synthesizer, speech evaluation, 2042
 - spectrometry, speech, 909
 - speech, maximum likelihood, 907
- pitch perception**, amplitude modulator, hearing, nonspectral pitch, noise stimulus, 1087
 - binaural hearing, hearing, noise, review, 900
 - hearing, pitch shift, 3349
- placebo**, biofeedback, medical instrumentation, pain, placebo effect, 1887
- placenta**, fetus, hypoxia, mathematic model, oxygen consumption, uterus contraction, 205
- placenta transfer**, amnion fluid, amnion sac, drug distribution, drug metabolism, fetus, guinea pig, rabbit, gottinger miniature pig, intraamniotic application method, intraamniotic administration, 3717
- plankton**, population model, 26
- plant**, agriculture, chelating agent, food chain, penthanil, plutonium 239, radioactive contamination, pu 239 uptake, usa, 95
 - growth, mathematic model, leaf distribution, 2408
- plasma**, blood, electrolyte balance, erythrocyte, magnetic field, potassium, sodium, rat, 1243
 - blood carbon dioxide, carbon dioxide, measurement, ericsen e 101, 2551
 - carbon dioxide, carbon dioxide electrode, carbonic acid, serum, potentiometry, 1393
 - computer model, digital computer, glucose tolerance test, insulin, proinsulin, 18 patients, 2767
- plasma renin activity**, aldosterone, correlation function, corticosterone, hydrocortisone, 1654
- plastic**, abortion, vacuum aspiration, metal versus plastic cannulae, 234
 - acetal, biocompatibility, cell culture, cytotoxicity, nylon, polyethylene, polystyrene, polyurethan, silastic, teflon, testing, 866
- plastic implant**, polymer, thrombogenesis, vein catheterization, 3286
- platinum**, electrode impedance, polarization impedance, 1890
- platinum electrode**, brain depth stimulation, cerebrospinal fluid, electrolysis, non gassing limit, 2090
 - brain depth stimulation, electrostimulation, implant, electrode area, 2086
 - electrode, electrostimulation, nervous system, electrochemical reaction, 1490
 - electrode impedance, time domain analysis, 2885

- electroencephalography, electroretinography, microelectrode, nerve cell potential, oxygen electrode, double barrelled electrode, simultaneous measurement, 2142
- plethysmography**, airway resistance, total lung volume, measurement apparatus, infant, 1935
 - aorta, artery wall compliance, thoracic aorta, measurement, modeling, dog, 2598
 - atherosclerosis, leg, high gain capacitive plethysmograph, 1056
 - cardiography, review, 2933
 - cassette recorder, electrocardiography, electroencephalography, physiology, sexual arousal, sexuality, vagina, vaginal photoplethysmography, cassette recorder, 1883
 - digital computer, lung volume, online measurement, 858
 - electrode, finger, impedance, electrode configuration, 1911
 - heart output, impedance plethysmography, thorax, thorax impedance, output computation, 2203
 - impedance plethysmography, lung edema, thorax impedance, edema measurement method, 2216
 - interstitial fluid, pressure, dog, 550
 - pressure, pressure transducer, temperature, volume, thermal problems, 949
 - table, automatically angiological tilting table, 1919
- plexiglass**, implant, microwave radiation, radiation hazard, 580
- plutonium 239**, agriculture, chelating agent, food chain, penanthil, plant, radioactive contamination, pu 239 uptake, usa, 95
 - body burden, bone, computer, neutron activation analysis, 811
- plutonium dioxide pu 239**, lung, alpha radiation, frequency of alpha particles in lung cell, 3253
 - neutron activation analysis, alpha decay, fragmentation of respirable puo₂ particles in water, 1421
- pneumatic prosthesis**, knee amputation, leg prosthesis, socket, pneumatic suspension, 2642
- pneumatic splint**, shock, 47 patients, pneumatic trousers, 3287
- pneumoconiosis**, computer, dyspnea, forced expiratory volume, medical record, subjective appreciation, 3847
 - statistics, logistic model, ordered categorical data, binary comparisons, paired data, 2387
- pneumoencephalography**, brain, cannula, stereotaxic surgery, substantia nigra, monkey, 2971
 - brain, brain hemorrhage, electricity, electric trauma, hydrocephalus, subarachnoid hemorrhage, cat, dog, man of 25, 239
 - brain angiography, brain tumor, computer assisted tomography, hypophysis tumor, ophthalmology, parasellar tumor, sella turcica tumor, false negative diagnosis, 4 cases, 818
 - brain angiography, computer assisted tomography, hypophysis adenoma, 12 cases, 792
 - brain angiography, brain artery aneurysm, brain scintigraphy, computer assisted tomography, sella turcica tumor, sellar and parasellar lesions, 76 in 5000 cases, 2731
 - brain arachnoid cyst, computer assisted tomography, hydrocephalus, sella turcica, third brain ventricle, case report, man of 19, neurosurgery, 1588
 - brain tumor, computer assisted tomography, hydrocephalus, 725 scans, 757
 - brain tumor, cerebrospinal fluid, electrocardiography, electroencephalography, hematoma, intracranial hypertension, telemetry, 20 cases, continuous recording, technique, 1487
 - computer assisted tomography, comparison, 813
 - computer assisted tomography, hydrocephalus, porencephaly, children, 1210
- pneumography**, atmosphere, lung, pressure transducer, respiration, 1912
 - diaphragm, functional residual capacity, lung function, 2952
 - fourier transform, information processing, lung, 2053
 - minicomputer, spirometry, impedance pneumograph, microprocessor, 1616
- pneumonia**, computer, heart arrhythmia, heart failure, heart infarction, intensive care, 1031 cases, 3090
- pneumotachygraphy**, air flow, mouth, speech, measurement of airflow, 654
- poikilothermy**, chemical kinetics, model, thermodynamics, 208
- polarimetry**, ellipsometer, photometry, photomultiplier, linearization, drift stabilization, 3650
- polarization microscopy**, ultraviolet microscopy, determination of optical parameters, 2556
- polarography**, diaphragm, oxygen consumption, high sensitivity device, rat, 1832
- policy**, industrial medicine, law, occupational safety, united states, osha sanctions, effectiveness, decision theory, decision models, 3751
- poliomyelitis virus**, attenuated virus, central nervous system, live vaccine, lumbar spine, mathematic model, neurovirulence, thalamus, virus, virus virulence, neurovirulence assay, monkey, 3492
- pollution**, annoyance, community, environmental sanitation, loudness, noise, perception, loudness scaling, 256
- polychlorinated biphenyl**, lake water, mathematic model, sediment, lake michigan, material balance study, 1246
- polyethylene**, acetal, biocompatibility, cell culture, cytotoxicity, nylon, plastic, polystyrene, polyurethane, silastic, teflon, testing, 866
 - aluminum oxide, ceramics, total hip prosthesis, tribologic aspects, 1622
 - capsule, endoneurium pressure, interstitial fluid, lead, nerve fiber, sciatic nerve, rat, 151
- polymer**, dielectric constant, .4-2 kHz, 3631
 - lipid membrane, bilayer membrane, stabilization, 3493
 - plastic implant, thrombogenesis, vein catheterization, 3286
 - viscometry, automation, capillary viscometer, 1386

- poly(methacrylic acid methyl ester)**, antibiotic agent, bone cement, oxacillin, high pressure insertion, 2
 - bone stress, fixation, implant, joint total replacement, strength of bonding, cyclic tensile loading, 865
 - prosthesis, stainless steel, prosthetic stem design, 2761
 - stainless steel, tensile strength, wire fixation, 1526
- polymorphism**, ecology, genetics, population model, stability, 2769
- polymorphonuclear granulocyte**, chemotaxis, mathematic model, phagocytosis, markov model, 396
- polyneuropathy**, alcoholism, amyotrophic lateral sclerosis, anterior tibial muscle, biceps brachii muscle, electromyography, motoneuron disease, muscular dystrophy, muaps, automatic analysis, 14 controls, 11 cases, 857
- polypropylene**, elbow, orthosis, flail elbow orthosis, 70 yr old woman, 1119
 - knee, orthosis, hinged orthosis, 2999
- polysiloxane**, arteriovenous shunt, biocompatibility, blood clotting, oxygenator, silastic, thrombocyte count, lamb, 1869
- polystyrene**, acetal, biocompatibility, cell culture, cytotoxicity, nylon, plastic, polyethylene, polyurethan, silastic, teflon, testing, 866
- polyurethan**, acetal, biocompatibility, cell culture, cytotoxicity, nylon, plastic, polyethylene, polystyrene, silastic, teflon, testing, 866
- polyvinylchloride**, airway obstruction, trachea tube, polyvinyl chloride tube, obstruction, 1543
- pons angle**, cerebellomedullary cistern, endoscopy, pterygoid fossa, apparatus description, 3273
 - computer assisted tomography, nose cavity, otorhinolaryngology, paranasal sinus, applications, 9 selected cases, 2719
 - cranial nerve, electrode, electrostimulator, nerve stimulation, apparatus, 678
- pons angle tumor**, acoustic impedance, brain stem, neurootology, stapes reflex, diagnostic value, 1683
 - acoustic nerve neurinoma, cisternography, computer assisted tomography, metrizamide, neurinoma, 10 cases, 3841
- population dynamics**, mathematics, model, statistics, whale, 9
- population exposure**, carbon 14, environmental contamination, nuclear power plant, radioactivity, c 14 production, 1334
 - environmental monitoring, ionization chamber, nuclear reactor, thermoluminescence dosimeter, vermont yankee nuclear power station, 1335
- population growth**, mathematic model, population model, equilibrium, 2776
- population model**, age, catastrophe, age group elimination, 5
 - birth rate, mortality, 1258
 - cancer, sampling, statistics, survival, truncated data, censored sample, 2403
 - cell cycle, cell kinetics, 25
 - cell division, cell proliferation, mathematic model, 2398
 - cell kinetics, cell proliferation, estrogen therapy, hormone, mice, 2406
 - cell population, lotka volterra model, 1634
 - compartment model, stability, competitive model, 1649
 - computer model, diffusion, nonlinear system, 1257
 - computer program, follow up, life table, risk factor, survival rate, 1637
 - diffusion, ecology, equation, migration, nonlinear system, differential equation, multispecies model, stability, 876
 - diffusion, lotka volterra model, oscillating system, 875
 - ecology, mathematic model, stability analysis, liapunov method, 423
 - ecology, genetics, polymorphism, stability, 2769
 - ecology, genetics, 34
 - environment, markov model, fibonacci phyllotaxis, 2763
 - epidemiology, model, mortality, statistics, competition, prey predator, 2785
 - evolution, asymmetry, 2789
 - gene frequency, inheritance, migration, mutation, statistics, stochastic model, island model, 2788
 - growth, distributed delay, 1643
 - lifespan, statistics, lifetime distribution, 2407
 - mathematic genetics, triploidy, 2770
 - mathematic model, switching effect, 2771
 - mathematic model, galton watson process, immigration, 27
 - mathematic model, weapon, arms race, 2784
 - mathematic model, population growth, equilibrium, 2776
 - plankton, 26
 - predation, two species, 2016
 - bifurcation theory, 1641
 - insect, 28
 - natural selection, 1644
 - lotka volterra equation, generalization, 29

- porcelain**, acrylic acid resin, wear test, 3486
- porencephaly**, brain atrophy, brain calcification, brain ischemia, brain tomography, brain tumor, computer assisted tomography, electroencephalography, partial epilepsy, 200 cases, 787
 - brain cyst, computer assisted tomography, 8 cases, 815
 - brain ventricle, cerebrospinal fluid shunting, computer assisted tomography, hydrocephalus, 4 cases, motor deficit, 1575
 - computer assisted tomography, hydrocephalus, pneumoencephalography, children, 1210
- portal vein**, bladder, blood vessel muscle, smooth muscle, quick load change, rat, rabbit, 2815
 - computer assisted tomography, intrahepatic bile duct, liver, simulation of dilated biliary ducts, 23 cases, 1206
- portal vein blood pressure**, liver vein, needle, 100 patients, percutaneous transhepatic measurement, chiba needle, method, wedge pressure, 1465
- positioning**, laser, radiotherapy, 3766
 - laser, radiation dose fractionation, radiotherapy, laser cross hair sidelight, 3387
- positioning device**, microscopy, spectrometry, television camera, ccd, 2541
- position transducer**, image processing, touch, tactile imaging, 980
- positive end expiratory pressure**, alarm monitoring, artificial ventilation, 746
 - artificial ventilation, newborn, resuscitator, manual ventilation, peep device, continuous positive pressure, new device, 3709
 - functional residual capacity, lung function test, measurement instrumentation, 2215
- positive pressure ventilation**, anesthesia, artificial ventilation, brain depth recording, small animals, rat, 1484
- positron camera**, fourier transform, image processing, radioisotope, positron annihilation, 728
 - positron emission tomography, tomography, object reconstruction, 3051
- positron emission tomography**, brain blood flow, brain scintigraphy, computer assisted tomography, edetic acid, gallium 68, krypton, positron scintiscanning, 120 cases, 799
 - computer assisted tomography, basic principle, 3842
 - positron camera, tomography, object reconstruction, 3051
- positron emitter**, computer assisted tomography, scintiscanning, principles, 1957
- positron scintiscanning**, brain blood flow, brain scintigraphy, computer assisted tomography, edetic acid, gallium 68, krypton, positron emission tomography, 120 cases, 799
 - computer assisted tomography, edetate gallium ga 68, scintillation camera, technetium 99m, emission computer assisted tomography, comparison, 1177
- posterior cranial fossa tumor**, acoustic nerve neurinoma, brain infarction, brain tumor, computer assisted tomography, 191 cases, 3835
 - brain tumor, computer assisted tomography, infratentorial tumor, 51 cases, 1187
- posterior fossa**, brain abscess, brain scintigraphy, brain tumor, computer assisted tomography, meningioma, subdural hematoma, review, 1194
 - brain white matter, cerebellum, computer assisted tomography, cerebellum white matter, 3821
- postgraduate education**, data base, information processing, medical documentation, model, retrieval system, medlars, medline, index medicus, usa, problem oriented medical data, 2751
- postoperative care**, atelectasis, open heart surgery, spirometry, incentive spirometer, bartlett edwards spirometer, prevention, 1868
 - computer, heart surgery, infusion, intensive care, monitoring, alabama, 2712
 - heart left atrium pressure, heart surgery, monitoring, transseptal monitoring, 3299
- postoperative complication**, embolism prevention, heel, support, thrombosis prevention, heel support device, 2925
- postsynaptic membrane**, endplate potential, mathematic model, postsynaptic potential, 1321
- postsynaptic potential**, endplate potential, mathematic model, postsynaptic membrane, 1321
- postsynaptic receptor**, model, nerve cell, photoreceptor, presynaptic receptor, retina, synapse transmission, 2844
- potassium**, bladder, chloride, freeze drying, roentgen analysis, skin, sodium, soft tissue, frog, toad, 2860
 - blood, electrolyte balance, erythrocyte, magnetic field, plasma, sodium, rat, 1243
 - brain, brain cortex, copper, electromagnetic radiation, hypothalamus, iron, magnesium, sodium, zinc, 1600 mhz, rat, 2564
 - cell membrane permeability, chloride, nerve fiber membrane, nerve fiber membrane permeability, nerve fiber membrane steady potential, ph, sodium, crayfish, 1718
 - dorsal spinocerebellar tract, mathematic model, nerve cell membrane steady potential, nerve cell potential, afterhyperpolarization, cat, 3179
 - excitable membrane, lipid membrane, membrane permeability, nerve fiber membrane, sodium, didactic presentation, 393
 - intestine absorption, liquid scintillation, whole body counter, whole body potassium, description of counter, clinical application, 595
 - lens potential, ouabain, temperature, oil chamber, bovine lens, asymmetry potential, 2243
- potassium channel**, cell membrane conductance, gating circuit, nerve fiber membrane, sodium channel,

- transient polarization current, squid, 2070
- cholinergic system, membrane permeability, no constant field, 935
- electric organ, sodium channel, temperature, electric fish, 76
- fat, model, pacemaker nerve cell, semiconductor, tetrodotoxin, 926
- learning, mathematic model, memory, nerve cell network, pattern recognition, sodium channel, synapse, 1316
- potassium chloride**, adenosine triphosphatase, amnesia, cycloheximide, lithium chloride, memory, ouabain, phenytoin, protein synthesis, sodium pump, 3 phase model, 241
- potassium electrode**, calcium electrode, chloride electrode, ion exchange, magnesium electrode, microelectrode, physicochemistry, 1343
- implantation, skull, spreading cortical depression, in vivo measurement, 3721
- potentiometer**, digital computer, hybrid computer, digital potentiometer, 3572
- powder**, crystal, piezoelectricity, demonstration device, 161
- power**, alamethicin, autocorrelation, lipid membrane, membrane permeability, membrane potential, multi pore system, autocorrelation analysis, power spectral density, 3549
- environment, solar energy, greenhouse effect, 146
- power amplifier**, microwave radiation, semiconductor, 108
- power control**, microprocessor, power supply, thyristor, digital control, 2491
- powered prosthesis**, above knee prosthesis, arm prosthesis, research program, 288
- amelia, arm prosthesis, congenital malformation, arm absence, shoulder absence, case report, 707
- finger tip, limb prosthesis, design, grip, 1108
- nerve stimulation, sensory nerve, tactile discrimination, vibration, human, 1902
- power line interference**, electric accident, electrocardiography, iec recommendation june 1976, 3235
- power measurement**, calorimetry, carbon dioxide laser, laser, co₂ laser, 174
- power supply**, artificial heart pacemaker, 2204
- bioelectronics, bioenergy, direct current converter, solar cell, telemetry, 3214
- bioenergy, galvanic current, voltage frequency converter, rat, dog, rabbit, 928
- brain depth stimulation, electrostimulation, implantation, lateral hypothalamus, constant current, rat, 3332
- coil, implant, telemetry, coil design, 2108
- electric accident, electric device, hospital, medical engineering, monitoring, electrical plug, safety precaution, 1138
- electron microscopy, voltage stabilizer, voltmeter, 981
- electron microscopy, magnetic field, magnetic lens, drift reduction, 1779
- microprocessor, power control, thyristor, digital control, 2491
- photomultiplier, inverter, 1398
- thyristor, inverter, 960
- preamplifier**, amplifier, counter, counting, 955
- electroencephalography, nerve cell potential, unrestrained animals, 110
- electroencephalography, evoked response, signal noise ratio, 1891
- predation**, population model, two species, 2016
- prefrontal cortex**, stereotaxic atlas, cat, 1078
- pregnancy**, artificial heart pacemaker, 2592
- cardiotocography, fetus, multichannel monitor, 1549
- computer, fetus hypoxia, fetus monitoring, 106 cases, computer analysis, deceleration delay index, 2327
- computer, delivery, fetus, fetus heart rate, labor, 1571
- delivery, labor, continuous posub 2 monitoring, transcutaneously, electrode, 564
- fetus, fetus maturity, 20 women, recorder, 3212
- fetus heart rate, fetus monitoring, telemetry, evaluation, hewlett packard 78100a, 521
- presbycusis**, hearing aid, perception deafness, 261 patients, follow up, 1103
- pressure**, interstitial fluid, plethysmography, dog, 550
- plethysmography, pressure transducer, temperature, volume, thermal problems, 949
- short circuit current, skin potential, pressure jump relaxation kinetics, frog, 1738
- pressure measurement**, body temperature, electromagnetic radiation, telemetry, fish, 968
- pressure transducer**, amplifier, manometry, strain gauge transducer, 1376
- atmosphere, lung, pneumography, respiration, 1912
- blood pressure, catheter, small animals, microtransducer, pressure step calibration, 2533
- brain, capacitance transducer, electromagnetic radiation, intracranial pressure, telemetry, epidural implantation, 971
- esophagus achalasia, esophagus peristalsis, esophagus pressure, gastrointestinal motility, gastrointestinal tract, scleroderma, 1351
- esophagus peristalsis, esophagus pressure, pressure transducer, human, 3570
- fiberoscope, head trauma, intracranial pressure, monitoring, 46 cases, 2231
- hip, human cadaver joint, local pressure measurement, 3144
- infection, monitoring, infection control design, 150

- intracranial pressure, monitoring, 1758
- intracranial pressure, monitoring, telemetry, rotterdam epidural teletransducer, 2493
- plethysmography, pressure, temperature, volume, thermal problems, 949
- pressure volume curve**, functional residual capacity, lung compliance, vital capacity, model, human, 3164
- presynaptic receptor**, model, nerve cell, photoreceptor, postsynaptic receptor, retina, synapse transmission, 2844
- preventive medicine**, multiphasic testing, periodic medical examination, screening test, principals for application, usa, 604
- primary health care**, computer, information processing, micro computer, norway, 1146
- prism**, afterimage, wilkinson model, 2569
 - eye surgery, loupe, low vision, microsurgery, visual aid, new device, 2295
- probability**, computer program, information processing, statistics, decomposition, algol, gaussian curve, 2404
 - computer program, digital computer, information processing, lateral geniculate body, minicomputer, spike, statistics, cat, 1617
 - statistics, markov chain, 22
- procaine**, calcium channel, heart muscle fiber, propranolol, sodium channel, verapamil, cat, 2412
- process control**, algorithm, computer program, laboratory automation, microprocessor, 2692
 - biofeedback, cheyne stokes breathing, chronic granulocytic leukemia, hematopoietic disease, mathematic model, nonlinear system, respiration, 1299
 - digital computer, microprocessor, 988
 - digital computer, nuclear magnetic resonance, spectrometry, 2531
 - digital computer, minicomputer, 2122
 - digital computer, ph measurement, errors, 3241
 - krypton 85, radioisotope, flow rate, leak testing, 2250
 - locomotion, manipulation, mathematic model, movement, 2796
- prognosis**, cerebrovascular accident, electrocardiography, automated analysis, 6 serial eeg, 26 volunteers, 1949
 - computer, mathematic model, multiple trauma, nomogram, respiration, trauma, 2 prognostic indices, 172 cases, 426
 - computer, heart infarction, stroke, interactive computer program, 3042
 - cost, decision, diagnosis, differential diagnosis, ischemic heart disease, mathematic model, mathematics, statistics, expected outcome loss, 759
- programming device**, radiography, serial radiography, 70 mm camera, 2668
- progressive multifocal leukoencephalopathy**, alcoholism, alzheimer disease, brain atrophy, computer assisted tomography, dementia, multiple sclerosis, parkinson disease, schilder disease, survey, 358
 - brain atrophy, brain tumor, computer assisted tomography, leukoencephalopathy, 3 cases, neuropathology, 2 autopsies, ultrastructure, diagnosis, 365
- proinsulin**, computer model, digital computer, glucose tolerance test, insulin, plasma, 18 patients, 2767
- projection**, data transmission, fourier transform, image processing, 979
- projector**, holography, multi color image, 2116
- prolactin blood level**, brain ventricle, cannulation, consciousness, gonadotropin, growth hormone blood level, method, dual cannulation, awake rat, 671
- pronation**, biomechanics, elbow, joint mobility, supination, 100 volunteers, 1658
- proplast**, trachea prosthesis, dog, histology, 1065
- proportional counter**, bone, gadolinium 153, photon absorption, xenon filled multiwire counter, 2095
- propranolol**, calcium channel, heart muscle fiber, procaine, sodium channel, verapamil, cat, 2412
- prostaglandin**, bulla, exudate, histamine, inflammation, kinin, skin, recovery, method, 3363
- prostate**, bladder carcinoma, computer assisted tomography, pelvis, pelvis cancer, survey, 3450
 - computer assisted tomography, gray scale echography, prostate carcinoma, prostatitis, 8 cases, 2739
 - electroejaculation, impedance, intestine, bull, 2957
- prostate biopsy**, endoscopy, punch biopsy, cold punch device, 1143
- prostate carcinoma**, computer assisted tomography, gray scale echography, prostate, prostatitis, 8 cases, 2739
- prostate scintiscanning**, body burden, dosimetry, zinc, zinc 69m, permissible body burden, 940
- prostatitis**, computer assisted tomography, gray scale echography, prostate, prostate carcinoma, 8 cases, 2739
- prosthesis**, acrylic acid, femur, stress, total hip prosthesis, charnley prosthesis, 2261
 - arm prosthesis, blood pressure, digital computer, electroencephalography, heart catheterization, microprocessor, monitoring, 2685
 - artery graft, biocompatibility, blood, cell kinetics, thrombocyte, thrombosis, 3
 - biofeedback, myoelectric control, occupational therapist, orthotics, 1113
 - bladder sphincter, urethra obstruction, urine incontinence, implantable hydraulic system, 2222
 - blindness, disabled, volume measurement, filling cup, 2258
 - body cast, orthopedics, seat, wheelchair, body cast vacuum form method, 280
 - cochlea, deafness, electrode, hearing aid, implantation, multiple electrode system, 3341
 - communication, disabled, transducer, morse decoding system, 1117

- copper, thrombosis, antithrombogenic properties, artificial surface, 1245
- disabled, electromyography, information processing, signal processing, 1744
- electrostimulation, feedback system, median nerve, perception, 2262
- femur, fracture, hip, implant, joint total replacement, mathematic model, 3131
- heart valve, protection by law, 3284
- hip, lubricating agent, lubrication, synovial fluid, total hip prosthesis, 3145
- poly(methacrylic acid methyl ester), stainless steel, prosthetic stem design, 2761
- ureter, urinary tract, review, 2615
- prosthetic alignment**, radiotherapy, method of quality control, 1124
- prosthetic material**, heart prosthesis, thrombosis prevention, surface characteristics, in vivo, 634
- protective clothing**, skin temperature, thermoregulation, water cooling, water perfused suit, 1440
- protective equipment**, aerosol, air sampling, occupational safety, personal sampling pumps review, 3748
- protein**, caloric intake, computer, nutrient, nutrition, intake estimation, 842
 - cell membrane, cell shape, image processing, roentgen radiation, electron microscopy, 3221
 - computer, data base, 2689
 - electrophoresis, high resolution electrophoresis system, human serum, 499
 - erythrocyte membrane, raman spectrum measurement, extraction, raman spectrum, 3121
 - hexadecane, lipid, membrane capacitance, bilayer membrane, membrane physical chemistry, 3629
- protein binding**, data base, macromolecule, file for macromolecular structures, crystallographic studies induced, atomic coordinates, partial bond connectivities, how to use it, 1147
- protein bound iodine 125**, cancer cell, cell membrane, binding, device, novikoff tumor cells, 947
- protein synthesis**, adenosine triphosphatase, amnesia, cycloheximide, lithium chloride, memory, ouabain, phenytoin, potassium chloride, sodium pump, 3 phase model, 241
 - mathematic model, oscillation, series expansion, 2396
- proton radiation**, oxygen isotope, localization test, 590
- pseudarthrosis**, arthrodesis, congenital hip dislocation, fracture external fixation, limb lengthening, 48 patients, ilizarov apparatus, 3743
 - femur, femur neck pin, osteomyelitis, 31 cases, interlocking nail, 3741
- pseudotumor**, cerebellum vermis, computer assisted tomography, meglumine diatrizoate, diagnostic pitfall, 5 cases, 1967
- psychiatry**, behavior, personal relation index, 2237
 - electroencephalography, electromagnetic radiation, telemetry, 972
- psychoanalysis**, computer model, freud counterwill theory, 1632
- psychologic test**, computer, electroencephalography, frequency analysis, wechsler scale, intellectual factor, 56 children, 2704
- psychology**, athlete, motivation, personality, sport, rating scale, coaching, 3474
 - information processing, task performance, man, 1495
- psychophysics**, auditory system, hearing, vision, 250
- psychosis**, computer assisted tomography, electroencephalography, organic psychosis, 12 children, 3446
- psychrometer**, environment, thermocouple, automatic scanning, 608
- pterygoid fossa**, cerebellomedullary cistern, endoscopy, pons angle, apparatus description, 3273
- ptosis**, blindness, computer assisted tomography, epiphora, exophthalmos, headache, mucocele, ophthalmoplegia, paranasal sinus, 4 cases, 2737
 - eyelid reconstruction, facial nerve paralysis, magnet, eyelid magnets, 276
- public health**, adverse drug reaction, drug monitoring, epidemiology, mathematic model, pattern recognition, pharmacokinetics, 1956
 - growth, information processing, longitudinal data, quality control, mixed longitudinal study, multidisciplinary study, netherlands, 2780
 - iodine 129, radiation exposure, 942
- public health school**, epidemiology, medical education, research, united states, three dimensional model, 2389
- public health service**, computer, general practice, health center, health visitor, information processing, medical record, nursing, social worker, real time management, great britain, 840
 - computer, health care delivery, library, medical documentation, patient care, patient care, literature coordination, 2695
 - computer program, hospital management, medical record, mumps, 2747
 - computer program, hospital management, medical record, mumps, 2746
 - computer program, hospital management, information processing, medical record, mumps, u.s.a., 2745
 - data base, documentation, hospital service, information processing, literature, network, heclinet system, gfr, 1228
 - medical instrumentation, paramedical education, technician, 382
 - pharmacotherapy, statistics, 416
- pulmonary hypertension**, lung artery pressure, mathematic model, noninvasive measurement, 922
- pulsatile flow**, artery flow, hemodynamics, mathematic model, 2060
 - artery flow, atherosclerosis, coronary artery, coronary artery blood flow, mathematic model, rheology,

- flow analysis, 2454
- artery occlusion, doppler ultrasound flow meter, hemodynamics, hydrodynamic bench, 3167
- atherogenesis, bifurcation, particle path and stasis, 2056
- blood flow, indicator dilution curve, mathematic model, 476
- capillary flow, skin capillary, flow measurement, 1383
- heart valve, heart valve prosthesis, heterograft, hancock porcine xenograft, model 242 and 250, 1844
- heart valve prosthesis, pressure gradient measurement, 1843
- pulse**, electrocardiography, monitory, skin conductance, transducer, volume, multifunction transducer, 1142
- oscilloscope, timer, pulse stretcher, 548
- pulse amplifier**, amplifier, nuclear radiation, 2864
- pulse frequency modulation**, heart rate, variability analysis method, 993
- pulse generator**, averaging, iron 57, nuclear magnetic resonance, pulse echo, element analysis, 2858
- cell membrane potential, heart muscle, light reflection, stimulator, capacitor discharge, frog, 78
- chopper, neutron radiation, propagation speed, 3674
- electrostimulator, modification grass sd9, 2103
- 2132
- pulse height analysis**, cesium 137, cobalt 58, cobalt 60, multichannel analyzer, gamma radiation, 10 x 10 channel, 189
- nerve cell potential, nervous system, spike, delay line, analog delay, 1492
- pulse shaper**, 2104
- pump**, clamp, heart ventricle enddiastolic volume, heart ventricle endsystolic volume, heart ventricle pressure, heart ventricle volume, isolated heart, servocircuit, volume clamber, dog, 3290
- device, extracorporeal circulation, pulsatile pump system device, dog, 1469
- gas flow, closed system, 1374
- all glass, 2536
- punch biopsy**, endoscopy, prostate biopsy, cold punch device, 1143
- puncture**, kidney tubule absorption, mathematic model, variance model, 2057
- pupil**, depth perception, laser, vision, 3539
- pupil reflex**, mathematic model, nonlinear system, black box, 3158
- model, reflection, 460
- pure tone audiometry**, amplitude modulator, hearing, noise, tone roughness, 56
- purkinje cell**, cerebellum, computer model, mathematic model, nerve cell network, frog, 487
- cerebellum cortex, computer model, mathematic model, nerve cell network, frog, 1717
- cerebellum cortex, memory, music, nerve cell network, pattern recognition, d neuronal network, 1732
- purkinje fiber**, heart muscle, heart ventricle, electrical connexion zone, dog, 2080
- pyelography**, computer assisted tomography, nephrostomy, 2 cases, 827
- pyelostomy**, nephrolithiasis, radiography, miniature vacuum cassette, 1531
- qrs complex**, algorithm, computer, electrocardiography, mathematic model, vectorcardiography, wave recognition algorithm, chest, 3180
- computer, electrocardiography, heart left ventricle ejection fraction, q wave, r wave, relation qrs forces to left ventricle ejection fraction, 2699
- quadriplegia**, bladder, bladder pacemaker, electrode, implant, micturition, paraplegia, spinal cord injury, urethra, baboon, 1486
- electric wheelchair, voice, voice control, 1112
- quality control**, computer, nuclear medicine, 3833
- computer, electrocardiography, electromyography, ergonomics, error, exercise electrocardiography, heart rate, 1164
- computer, performance, sport, training, decathlon, model analysis, computer generated scoring tables, 3475
- computer, doctor patient relation, physician, 2683
- electrocardiography, electrode, exercise electrocardiography, hyperventilation, medical instrumentation, standards, task force, 3291
- growth, information processing, longitudinal data, public health, mixed longitudinal study, multidisciplinary study, netherlands, 2780
- quantum mechanics**, biophysics, review, 2019
- model, muscle contraction, sliding filament theory, quantum mechanical formation, 2419
- perception, 3123
- perception, neumann theory, 2790
- quantum theory**, adenosine diphosphate, adenosine triphosphate, model, muscle contraction, sliding filament theory, transducer, quantum mechanical transducer model, 2033
- questionnaire**, computer, target orientated construction, 2693
- q wave**, computer, electrocardiography, heart left ventricle ejection fraction, qrs complex, r wave, relation q forces to left ventricle ejection fraction, 2699

- adar**, artificial heart pacemaker, microwave radiation, 16 pacemakers, susceptibility, 218
 - environment, microwave radiation, occupational health, radiation hazard, radiation sources, 3660
- adiation**, densitometry, lung congestion, lung density, lung edema, gamma radiation, samarium 153, 1332
 - image intensifier, magnesium fluoride, 312
 - light, narrow band lamp, high intensity radiation, 1006
 - pig pen, miniature pig, chronic exposure, 2655
- adiation absorption**, atomic number, nuclear radiation, photon absorption, radiation scattering, radiotherapy, roentgen dose distribution, 727
 - diathermy, electromagnetic radiation, physiotherapy, penetration depth, 1909
 - electromagnetic field, electromagnetic radiation, environment, radiation hazard, 584
 - electromagnetic radiation, trunk, 3714
 - electromagnetic radiation, mathematic model, man, animal, 2567
 - electromagnetic radiation, thermography, 449
 - electromagnetic radiation, model, induced electromagnetic field, 2275
 - head, microwave radiation, thermography, man, monkey, 1819
- alpha radiation**, lung, plutonium dioxide pu 239, frequency of alpha particles in lung cell, 3253
- adiation attenuation**, bone, dosimetry, megavoltage radiotherapy, roentgen dose distribution, 2096
- adiation beam**, fast electron therapy, scattering foil, field flattening, 3761
 - fast proton radiation, oxygen isotope, beam localization, 3251
 - neutron therapy, radiation dose fractionation, 2906
- adiation counting**, solar cell, 2560
- adiation depth dose**, cobalt 60, megavoltage radiotherapy, radiation scattering, corrections, 1418
 - cobalt therapy, megavoltage radiotherapy, radiation scattering, dose correction, 3668
 - megavoltage radiotherapy, therapy, computer, 3669
 - megavoltage radiotherapy, therapy, physical characterization, 597
- adiation detection**, computer assisted tomography, ionization chamber, roentgen radiation, xenon, fan beam computed scanner, 3810
 - dosimetry, linear accelerator, megavoltage radiotherapy, silicon diode, 2664
 - liquid crystal, microwave radiation, radiation hazard, 2151
 - megavoltage radiotherapy, roentgen radiation, silicon diode, compensating shield for diode, 2663
 - negative pion radiation, radiation field, roentgen dose distribution, charge collector, 3567
 - radiography, roentgen tube, kvp measurement, digital readout, 3664
 - silicon pn junction detector, temperature compensated direct current circuit, detector behavior, 3563
- adiation dose**, computer program, radium needle, radium therapy, 822
 - cyclotron, fast neutron radiation, physical characteristics, 2093
- adiation dose fractionation**, s (2 aminoethyl) isothiuronium, lifespan, mortality, whole body radiation, mouse, 2903
 - cell kinetics, computer, radiation survival, radiotherapy, simulation of radiobiological data, 845
 - dosimetry, radiation field, radiotherapy, time dose effect, matching of adjacent fields, 2670
 - laser, positioning, radiotherapy, laser cross hair sidelight, 3387
 - mathematic model, radiotherapy, tolerance dose, volume dependence, 1341
 - neutron therapy, radiation beam, 2906
 - roentgen radiation, skin, skinfold, stiffness, rupture, split dose, effects, rats, 1272
- adiation dosimetry**, radiotherapy, instrument for routine measurement, 3247
- adiation energy**, roentgen screen, x ray film, screen film system speed, 2251
- adiation exposure**, betatron, dosimetry, linear accelerator, neutron radiation, 2852
 - computer assisted tomography, gonad radiation, thermoluminescence dosimeter, 121 cases, emi scan, 2727
 - digital display, display system, victoreen model 555, nodule, 297
 - dosimetry, mathematic model, phantom, japanese adult, 99
 - dosimetry, thallium 201, nuclear parameter, 301
 - dosimetry, radiodiagnosis, energy dependence, 2278
 - image quality, radiography, image information content, patient exposure, 2853
 - iodine 129, public health, 942
 - mammography, radiation scattering, intensity of scatter radiation, 3017
 - radiography, phantom measurement, 3020
- radiation field**, central nervous system, cobalt therapy, linear accelerator, orthogonal field, dose distribution, 3025
 - computer, dosimetry, radiotherapy, irregular field computer program, 2358
 - dosimetry, radiation dose fractionation, radiotherapy, time dose effect, matching of adjacent fields, 2670
 - dosimetry, radiotherapy, irregularly shaped field, 744
 - megavoltage radiotherapy, neutron spectrometry, thermoluminescence dosimeter, 2279
 - negative pion radiation, radiation detection, roentgen dose distribution, charge collector, 3567

- radiotherapy, device for insuring congruency of opposed field, 2671
- radiotherapy, therapy, field recording, photographic method, 1132
- gamma radiation**, americium, fluorescent scanning, iodine, thyroid gland, concentric source detector design, 308
- attenuation, roentgen radiation, extrapolation, biologic material, 2665
- beam profile, cobalt 60, contour, radiotherapy, central axis, 2273
- beta radiation, thermoluminescence dosimeter, lif response, effect of annealing, 2156
- beta radiation, dosimetry, phantom, radiotherapy, roentgen radiation, tissue equivalent, 2928
- cell culture, cyclotron, fast neutron radiation, fibroblast, hemopoietic cell, leukemia cell, relative biologic effectiveness, radiologic calibration program, hamster, human fibroblast, mouse, guinea pig, 2094
- cesium 137, cobalt 58, cobalt 60, multichannel analyzer, pulse height analysis, 10 x 10 channel, 189
- cobalt 60, dosimetry, ionization chamber, phantom, radiotherapy, 3013
- cobalt 60, dosimetry, fast electron radiation, lithium fluoride dosimeter, radiotherapy, thermoluminescence, 1129
- collimator, tomography, coincidence scanning, 1915
- computer, deoxyguanosine phosphate, erythrocyte sedimentation rate, free radical, computer analysis of es spectrum, 2343
- computer assisted tomography, densitometry, radiation scattering, roentgen radiation, compton scatter, 810
- computer assisted tomography, scintigraphy, stochastic model, 1016
- computer assisted tomography, fourier transform, image processing, scintigraphy, 1218
- densitometry, lung congestion, lung density, lung edema, radiation, samarium 153, 1332
- dosimetry, thermoluminescence, automation, 1015
- dosimetry, radiotherapy, p n junction, temperature drift, semiconductor dosimeter, 1922
- dosimetry, neutron radiation, determination of dosimeter sensitivity, 2160
- dosimetry, fast neutron radiation, fission neutron radiation, luminescence dosimeter, 2159
- dosimetry, ferrous sulfate dosimeter, radiotherapy, calibration comparison, 730
- dosimetry, fast neutron radiation, geiger mueller counter, ionization meter, radiotherapy, fast neutron sensitivity, 1128
- dosimetry, radiotherapy, thermoluminescence, signal noise ratio, differential method, 3788
- fast electron radiation, megavoltage radiotherapy, thermoluminescence dosimeter, lif response, 1131
- hematology, mathematic model, radioisotope, scintigraphy, 2465
- image processing, radioisotope, scintigraphy, 1918
- image processing, radiocardiography, radioisotope, scintigraphy, technetium 99m, 3378
- radioactive dust, particle sizer, 594
- scintigraphy, scintillation camera, mobile camera, 311
- scintigraphy, scintillation camera, orthogonal light propagation, 304
- scintillator, zinc sulfide, fast decay, 1821
- thermoluminescence dosimeter, zirconium dioxide dosimeter, 1423
- whole body counter, hamburg counter, updating, 302
- radiation hazard**, antenna, microwave radiation, avoidance, 1011
- antenna, brain depth stimulation, chemotherapy, microwave radiation, stereotaxis, 2172
- body temperature, calorimetry, heat clearance, microwave radiation, mice, 2433
- brain, head, microwave radiation, cross polarized wave, mammal, 583
- brain, enzyme, homoprotocatechuic acid, microwave radiation, rat, 3628
- chromosome, pattern classification, 1540
- electromagnetic field, electromagnetic radiation, environment, radiation absorption, 584
- electromagnetic radiation, industrial medicine, microwave radiation, occupational health, 3659
- environment, microwave radiation, occupational health, radar, radiation sources, 3660
- implant, microwave radiation, plexiglass, 580
- ionization chamber, radiography, victoreen 570, 2658
- ionization chamber, radiography, victoreen 666, 2657
- kidney, liver, testis, ultrasonics, rabbit, 1828
- liquid crystal, microwave radiation, radiation detection, 2151
- microscopy, ultrasonics, 299
- microwave radiation, restraining device, monkey, 1438
- ultrasonics, usa regulations, 1824
- radiation injury**, alkaline phosphatase isoenzyme, bone, intestine, whole body radiation, biologic dosimetry, rat, 1162
- averaging, signal detection, optimal use, 3836
- bone, crystal, electron spin resonance, random orientation, 187
- electromagnetic radiation, eye, magnetic field, retina, rat, ultrastructure, 254
- radiation isodose distribution**, cobalt therapy, computer assisted tomography, therapy, phantom, 3075
- computer, fast electron therapy, treatment planning, 3065

- adiation monitoring**, dosimetry, ionizing radiation, radiation protection, automatic badge reading, 3390
- adiation protection**, dosimetry, ionizing radiation, radiation monitoring, automatic badge reading, 3390
 - fluoroscopy, automatic controlled unit, survey, 719
 - ionizing radiation, linear accelerator, uranium, 2667
- adiation resistance**, fast electron radiation, megavoltage radiotherapy, water air mass stopping power ratio, 3384
- adiation scattering**, atomic number, nuclear radiation, photon absorption, radiation absorption, radiotherapy, roentgen dose distribution, 727
 - cobalt 60, megavoltage radiotherapy, radiation depth dose, corrections, 1418
 - cobalt therapy, megavoltage radiotherapy, radiation depth dose, dose correction, 3668
 - collimator, fast neutron radiation, neutron radiation, 596
 - collimator, fast neutron radiation, 3257
 - computer assisted tomography, densitometry, gamma radiation, roentgen radiation, compton scatter, 810
 - dosimetry, mammography, back scattering, 3371
 - echography, ultrasonics, 731
 - image processing, radiography, new grid, 3374
 - mammography, radiation exposure, intensity of scatter radiation, 3017
 - radiography, removal of scatter, device, 2669
- adiation survival**, cell kinetics, computer, radiation dose fractionation, radiotherapy, simulation of radiobiological data, 845
- adioactive aerosol**, aerosol, air blood barrier, lung alveolus, alveolar microenvironment, review, 648
 - lung clearance, mathematic model, scintigraphy, lung burden, detector of adjustable response, 1063
- adioactive contamination**, agriculture, chelating agent, food chain, penanthil, plant, plutonium 239, pu 239 uptake, usa, 95
 - air, environmental monitoring, occupational exposure, radon 222 daughter, workroom air, working level, 2904
 - body burden, radium 226, strontium 90, retention, excretion, 2 cases, 10 yr follow up, 94
 - environmental monitoring, uranium mine, water system, uranium milling, new mexico, 1336
 - technetium 99m, vegetation, uptake, soybean and wheat, 941
- adioactive dust**, gamma radiation, particle sizer, 594
- adioactive microsphere**, computer, heart output, calculation, pdp 11, 3096
- adioactive waste**, iodine 131, filter system, clinical experience, 497
- adioactive wire**, radiography, radioisotope therapy, source localization, 3026
- adioactivity**, background radiation, decision, dosimetry, model, statistics, statistical interpretation of counting data, 306
 - beta radiation, evolution, optical purity, 2850
 - carbon 14, environmental contamination, nuclear power plant, population exposure, c 14 production, 1334
 - dosimetry, megavoltage radiotherapy, roentgen radiation, 45 mv, 732
- adiocardiography**, blood flow, computer, scintillation camera, 131 cases, 2349
 - computer, heart catheterization, heart output, heart stroke volume, lung artery pressure, lung blood volume, mitral valve stenosis, mitral valve area, 33 patients, 2754
 - image processing, gamma radiation, radioisotope, scintigraphy, technetium 99m, 3378
- adiodiagnosis**, dosimetry, radiation exposure, energy dependence, 2278
- adiofrequency generator**, nuclear magnetic resonance, 1818
- adiography**, aluminum oxide, conductivity, 3202
 - autoradiography, image intensifier, thiourea, image improvement, underexposed radiography, 3391
 - breast biopsy, computer, data base, diagnosis, mammography, pathology, interclinical cross check, 708 cases, austria, 3430
 - camera, focal point, focal spot camera, 3767
 - computer, image processing, image storage, image retrieval, roentgen tele data system, 1595
 - computer, information system, nuclear medicine, automated system, 1971
 - computer, automatic pathology diagnostic feedback, 3839
 - computer, diagnosis, lung, thorax radiography, 2316
 - computer, computer assisted reporting, 2350
 - computer assisted tomography, image processing, 3782
 - computer assisted tomography, image processing, roentgen radiation, scintigraphy, scintillation camera, calculus, 2348
 - computer model, image processing, image quality, resolving power, siemens star, artifacts, 316
 - computer model, image quality, 939
 - computer program, medical record, darr, automatic documentation, 1981
 - computer program, medical record, automatization, 376
 - digital computer, echography, image processing, nuclear magnetic resonance, reprography, thermography, 3459
 - fiberoscope, image intensifier, image contrast, 1916

- fluoroscopy, modulation transfer function, 1928
- fluoroscopy, image intensifier, calibration, 1534
- focal point, image processing, roentgen tube, 317
- heart movement, automatic control system, 742
- image converter, solid state converter screen, 313
- image intensifier, modulation transfer function, tube lens, 2285
- image intensifier, photography, miniaturization, 2281
- image intensifier, roentgen radiation, 3772
- image intensifier, roentgen radiation, image contrast, sienens pantoskop 3, 1532
- image processing, image storage, image retrieval, 1538
- image processing, optical lens, scintigraphy, fresnel zone plate, 2512
- image processing, radiation scattering, new grid, 3374
- image processing, roentgen radiation, visual system, soft roentgen radiation, mirror, 3027
- image processing, photography, tomography, camera, photographic reconstruction, 3787
- image production, model, statistics, unified view of imaging system, 1923
- image quality, roentgen radiation, total unsharpness, 303
- image quality, radiation exposure, image information content, patient exposure, 2853
- image quality, phantom, 3019
- ionization chamber, radiation hazard, victoreen 570, 2658
- ionization chamber, radiation hazard, victoreen 666, 2657
- ionization chamber, model, roentgen radiation, energy dependence, 3665
- knee, landmarks on lateral radiograph during rotation, 298
- lung, nebulization, radioisotope, 2288
- mathematic model, medical education, radiotherapy, photon path, path visualization, 1966
- microfilm, 355
- nephrolithiasis, pyelostomy, miniature vacuum cassette, 1531
- programming device, serial radiography, 70 mm camera, 2668
- radiation detection, roentgen tube, kvp measurement, digital readout, 3664
- radiation exposure, phantom measurement, 3020
- radiation scattering, removal of scatter, device, 2669
- radioactive wire, radioisotope therapy, source localization, 3026
- roentgen, device for testing accuracy, 1537
- roentgen picture, source coding, 3769
- localizing device, 3707
- television circuit, film reading, interhospital television transmission, 1924
- film changer, small animal radiography, film changes, 3771
- radioimmunoassay**, bioassay, computer, information processing, desk top computer, 755
 - gamma counting, hospital laboratory, iodine 125, 3250
- radioisotope**, angina pectoris, heart muscle, image processing, infarction, thallium 201, 2287
 - body burden, maximum permissible concentration, medical internal radiation dose committee, 3566
 - fourier transform, image processing, positron camera, positron annihilation, 728
 - gamma emitter, calibration, 97
 - hematology, mathematic model, gamma radiation, scintigraphy, 2465
 - image processing, gamma radiation, scintigraphy, 1918
 - image processing, gamma radiation, radiocardiography, scintigraphy, technetium 99m, 3378
 - krypton 85, process control, flow rate, leak testing, 2250
 - laminar air flow, tracer sphere flow measurement method, 1378
 - laminar air flow, model, flow measurement methods, 1377
 - lung, nebulization, radiography, 2288
- radioisotope therapy**, computer, dosimetry, gold 198, iridium 192, 2723
 - computer, roentgen dose distribution, computerization of afterloading system, 1958
 - computer, dosimetry, gynecologic cancer, radiotherapy, 1200 cases, 1220
 - iridium 192, modified afterloading technique, 1123
 - radioactive wire, radiography, source localization, 3026
- radiology**, medical record, retrieval system, speech, patient name, 3012
 - patient identification, system, 3016
 - scintigraphy, scintillation camera, quality control, 733
- radiology department**, health care planning, resource allocation, canada, model, 3388
- radiometry**, electromagnetic radiation, solar radiation, sunlight, 1814
- radioreceiver**, amplifier, cooling, signal noise ratio, 1762
- radiotherapy**, abdominal wall, computer assisted tomography, metastasis, uterine cervix carcinoma, case report, 3812
 - abdominal wall, computer assisted tomography, therapy, tumor, whole body radiation, 16 years old girl, 1181

- atomic number, nuclear radiation, photon absorption, radiation absorption, radiation scattering, roentgen dose distribution, 727
- beam profile, cancer, pion radiation, roentgen dose distribution, 3431
- beam profile, cobalt 60, contour, gamma radiation, central axis, 2273
- beam profile, dosimetry, pion radiation, 3372
- beta radiation, dosimetry, phantom, gamma radiation, roentgen radiation, tissue equivalent, 2928
- betatron, dosimetry, megavoltage radiotherapy, tissue maximum ratio, tumor maximum ratio, 2482
- body position, whole body repositioning system, 3381
- brain tumor, computer assisted tomography, 26 cases, 3814
- brain tumor, computer assisted tomography, evaluation therapeutically induced changes, 25 cases, 3072
- breast carcinoma, computer, therapy, computer aided medical decision making, 25 cases, 1593
- bruising, ultrasonics, guinea pig, 3785
- calcium fluoride dosimeter, lithium fluoride dosimeter, neutron radiation, thermoluminescence dosimeter, 1920
- cancer, computer assisted tomography, diagnostic role, 809
- cancer, computer, neutron therapy, roentgen dose distribution, G.D.R., 1976
- cancer, cancer chemotherapy, diagnosis, mathematic model, statistics, therapy evaluation, 2361
- cancer, computer, roentgen dose distribution, 3064
- cancer, computer assisted tomography, whole body scanning, treatment planning, follow up, 167 cases, 2345
- cancerogenesis, computer program, dose response, nuclear radiation, value, 2331
- cell kinetics, computer, radiation dose fractionation, radiation survival, simulation of radiobiological data, 845
- cobalt 60, dosimetry, ionization chamber, phantom, gamma radiation, 3013
- cobalt 60, dosimetry, fast electron radiation, lithium fluoride dosimeter, gamma radiation, thermoluminescence, 1129
- cobalt therapy, computer model, mathematic model, 1965
- computer, linear accelerator, therapy, 2334
- computer, information processing, medical record, 1196
- computer, medical record, data entry system, 3456
- computer, computer assisted tomography, therapy, method, 3417
- computer, dosimetry, gynecologic cancer, radioisotope therapy, 1200 cases, 1220
- computer, dosimetry, radiation field, irregular field computer program, 2358
- computer, contouring device, roentgen dose distribution, computer compatible, 1917
- computer, therapy, 3 dimensional treatment planning system, 3083
- computer, medical record, case recording, 3804
- computer assisted tomography, therapy, 3831
- computer assisted tomography, therapy, efficiency, 2726
- computer assisted tomography, echography, therapy, cross section determination, 2360
- computer assisted tomography, therapy, 3843
- dosimetry, gamma radiation, p n junction, temperature drift, semiconductor dosimeter, 1922
- dosimetry, ferrous sulfate dosimeter, gamma radiation, calibration comparison, 730
- dosimetry, radiation dose fractionation, radiation field, time dose effect, matching of adjacent fields, 2670
- dosimetry, radiation field, irregularly shaped field, 744
- dosimetry, fast proton radiation, ferrous sulfate dosimeter, linear energy transfer, 1130
- dosimetry, fast neutron radiation, geiger mueller counter, ionization meter, gamma radiation, fast neutron sensitivity, 1128
- dosimetry, negative pion radiation, roentgen dose distribution, 1127
- dosimetry, radiotherapy facility, 1913
- dosimetry, gamma radiation, thermoluminescence, signal noise ratio, differential method, 3788
- echography, ultrasonics, review, 2267
- filter, hodgkin disease, roentgen dose distribution, tissue compensating filter, moire topography, 307
- gynecologic cancer, pelvis cancer, radiation portal, verification film, 28 cases, 3377
- laser, positioning, 3766
- laser, positioning, radiation dose fractionation, laser cross hair sidelight, 3387
- linear energy transfer, neutron radiation, phantom, pion radiation, roentgen dose distribution, 1198
- mathematic model, medical education, radiography, photon path, path visualization, 1966
- mathematic model, radiation dose fractionation, tolerance dose, volume dependence, 1341
- monitoring, television, closed circuit television, problematic patient, 3768
- negative pion radiation, pion filter, 1542
- prosthetic alignment, method of quality control, 1124
- radiation dosimetry, instrument for routine measurement, 3247
- radiation field, device for insuring congruency of opposed field, 2671
- radiation field, therapy, field recording, photographic method, 1132

- skin elasticity, in vivo measurements, apparatus, 2646
- radiotransmitter**, telemetry, snap harness, rat, 3583
- radioulnar dislocation**, biomechanics, distal radioulnar joint, biomechanics, 6 operative techniques, 2799
- radium**, computer, parathyroid gland, parathyroid scintiscanning, pertechnetate acid tc 99m, scintiscanning, toluidine blue i 131, preoperative localization, 3440
- radium 226**, body burden, radioactive contamination, strontium 90, retention, excretion, 2 cases, 10 yr follow up, 94
- radium needle**, computer program, radiation dose, radium therapy, 822
- radium therapy**, computer program, radiation dose, radium needle, 822
- radon 222 daughter**, air, environmental monitoring, occupational exposure, radioactive contamination, workroom air, working level, 2904
- radon daughter**, air sampling, atmospheric radioactivity, filter, filter efficiency, 1337
- raman spectrum measurement**, erythrocyte membrane, protein, extraction, raman spectrum, 3121
- ranking test**, physiology, statistics, 2013
- ranvier node**, computer model, mathematic model, nerve conduction, 2847
 - nerve conduction, nerve fiber, spike, theory, method, 2072
- raphe nucleus**, artifact reduction, microiontophoresis, nerve cell potential, stimulation artifact, technique, 1806
- rapid eye movement**, computer, eye movement, saccadic eye movement, analysis, 3855
- rat**, grip strength, mouse, muscle strength, recording device, 3361
- raynaud phenomenon**, blood pressure, cooling, finger, skin temperature, pressure measurement, human, 2208
- reaction time**, auditory threshold, hearing, cat, titration procedure, 1092
 - behavior, hearing, restraining device, tone, cat, 2245
 - evoked cortical response, latent period, p 300, stimulus evaluation time, chronometry, 1882
 - histogram, histogram generation device, 3725
- reading aid**, character recognition, pattern recognition, hand printing, 3739
 - character recognition, pattern recognition, hand printing, 3738
 - character recognition, pattern recognition, handwriting, 3737
 - decision, pattern recognition, statistics, character recognition, 531
- receiver**, diode, mixing, signal noise ratio, telemetry, 119
 - electromagnetic radiation, microwave radiation, neurotransmitter, telemetry, 183
 - nuclear magnetic resonance, spectrometry, blocking effect, 1416
- receptive field**, spatial frequency characteristics, 3736
- receptor potential**, mechanoreceptor, skin receptor, potential recording, insect, 2256
- recognition**, face, signal detection, vision, 28 volunteers, 3722
 - memory, model, multiple observation model, 2006
- recording**, anesthesiology, tape recorder, 2289
 - bone disease, bone stress, magnetic field, piezoelectricity, non invasive method, 3005
 - electrocardiography, frequency analysis, st segment, high side frequency filtration, 639
 - electrocardiography, ink writing, st segment, st distortion, direct writing recorders, 1051
 - environment, thermistor, thermometer, water quality, 1799
 - kinetocardiography, capillary damped pick up, calibration unit, 2187
 - oscilloscope, sweep generator, logarithmic time base, 2866
- record storage**, cadaver identification, computer, forensic odontology, identification method, 1556
- recovery room**, coronary care unit, electric accident, emergency ward, hospital, intensive care, labor room, operating room, safety, maryland lutheran hospital, 502
- recruitment**, mathematic model, motor unit, muscle contraction, muscle isometric contraction, rate coding, 1661
- rectilinear scintiscanning**, scintiscanning, uptake probe, 2905
- rectum pressure**, anorectal pressure, anus, anus continence, constipation, portable 3 channel unit, 210
- rectus abdominis muscle**, abdominal wall, fentanyl, muscle tone, transducer, measurement, 143
- recurrent inhibition**, decerebration, nerve cell potential, rensaw cell, dynamic properties, extracellular recording, cat, 1735
- red nucleus**, lateral geniculate body, mathematic model, nerve cell potential, reticular formation, spike, markov model, ventrobasal complex, 1313
- reduced nicotinamide adenine dinucleotide**, computer model, energy transfer, glucose, glycolysis, heart muscle, heart perfusion, nicotinamide adenine dinucleotide, rat, 1631
- reflection**, model, pupil reflex, 460
- reflex time**, electrostimulation, middle ear, tensor tympani muscle, tongue, bipolar electric stimulation, device, 1506
- refraction**, aniseikonia, astigmatism, binocular vision, retina correspondence, retina image, problem of distortion, 2988
 - gas mask, spectacle glasses, vision, spectacle inserts, 2630
 - laser, 30 cases, meridional method, 168
 - optometry, automatic device, 400 eyes, 681

fraction index, digital computer, light diffraction, muscle fiber, sarcomere, ccd, 177

refrigerator, heat exchanger, dilution refrigerator, 3618

gression, information processing, statistics, least square method, 2400

- pattern recognition, speech, speaker independent recognition, 2869

habilitation, ankle, fracture external fixation, joint mobility, osteosynthesis, physiotherapy, talipes equinus, tibia fracture, foot movement plate, 3742

- biofeedback, electromyography, toy, myodisplay instrument, child, 279
- gait, leg brace, oxygen consumption, spinal cord injury, spinal cord transverse lesion, walking, 3 cases, pneumatic orthosis, 289

lative biologic effectiveness, cell culture, cyclotron, fast neutron radiation, fibroblast, hemopoietic cell, leukemia cell, gamma radiation, radiologic calibration program, hamster, human fibroblast, mouse, guinea pig, 2094

m sleep, alertness, computer, electroencephalography, electromyography, 5 hydroxytryptophan, levodopa, sleep spindle, stage 3 sleep, automatic classification, cat, 1620

- alertness, computer, electroencephalography, electromyography, sleep, telemetry, rat, automatic analysis, 2111
- alpha rhythm, computer, electroencephalography, multichannel recorder, sleep, 10 subjects, automation, 2706
- computer, electroencephalography, sleep, spindle, spindle detection, 4 volunteers, 4 patients, phase locked loop, 3424
- electrocorticography, electromyography, sleep, stage 3 sleep, rat, sleep stage, automation, 1995
- electroencephalography, parameter extraction, sleep, time series, automatic classification, 1951

nal plasma flow, computer, hippuric acid i 125, scintillation camera, rat, 1069

novascular hypertension, blood pressure, blood vessel resistance, kidney failure, mathematic model, sodium, water, 2420

nshaw cell, decerebration, nerve cell potential, recurrent inhibition, dynamic properties, extracellular recording, cat, 1735

- hodgkin huxley equation, nerve cell membrane, nerve cell membrane capacitance, nerve cell potential, time, repetitive firing, model, 1724

nography, digital computer, echography, image processing, nuclear magnetic resonance, radiography, thermography, 3459

scue personnel, accident, cost, law, equipment, organization, minden gr, 2575

- ambulance, emergency health service, helicopter, german federal republic, equipment, 5 yrs experience, ulm, 3569

search, accident, safety, model, 3500

- epidemiology, medical education, public health school, united states, three dimensional model, 2389

sidual capacity, lung function test, lung volume, isopressure flow curve, recording device, 2953

sistance, cell fluid, conductivity, micropipette, indirect measurement, 1809

- cell membrane, microelectrode, tip geometry, 1808
- chemical kinetics, photolysis, ionization reaction, 558
- environment, soil, soil resistivity measurement, 2890

solution, image intensifier, modulation transfer function, microchannel plate image intensifier, 3022

- scintillation camera, survey, 2570

solving power, brain tomography, computer assisted tomography, contrast intensification, 2346

- computer model, image processing, image quality, radiography, siemens star, artifacts, 316
- electron microscopy, astigmatism control, 3222
- frequency discrimination, hearing, 2982
- microscopy, ultrasonic microscope, ultrasonics, 2870
- microscopy, annular aperture, 1780
- television camera, vidicon, emr, photoelectric, 3597

sonance, earmould, hearing aid, model, sound filtering, side branch, parallel vent, acoustical model, electrical model, 3729

- microwave generator, electron wave interaction, 3658

source allocation, health care planning, radiology department, canada, model, 3388

spiration, air flow, analog computer, expiration, inspiration, integrator, lung volume, drift suppression, 2377

- air flow, respiratory flowmeter, calibration, 1482
- airway, lung compliance, lung elasticity, model, flow limiting segment, 442
- airway, airway resistance, bronchus tree, entropy, lung vascular resistance, mathematic model, morphology, branching tree, 434
- alarm monitoring, artificial ventilation, monitoring, device, 2606
- anemometry, thermistor, shunted sensor, 1871
- atmosphere, lung, pneumography, pressure transducer, 1912
- aviation, electrocardiography, electroencephalography, electromyography, skin conductance, inexpensive recording method, 296

- biofeedback, cheyne stokes breathing, chronic granulocytic leukemia, hematopoietic disease, mathematic model, nonlinear system, process control, 1299
- body plethysmography, computer model, lung compliance, 439
- cardiology, data base, histopathology, information processing, pathology, ssis, 3087
- catalase, escherichia coli, superoxide dismutase, ultraviolet radiation, continuous flow system, 1344
- computer, mathematic model, multiple trauma, nomogram, prognosis, trauma, 2 prognostic indices, 172 cases, 426
- convection, gas transport, lung diffusion, mathematic model, green function, 2050
- electrocardiography, telemetry, low power, 529
- equation, gas bubble, lung diffusion, neon, nitrogen, oxygen, counter diffusion, 2051
- exercise, expiration, inspiration, mathematic model, 465
- functional residual capacity, lung ventilation, occlusion pressure, volunteer, 2052
- gas, gas flow, mass spectrometry, gas inlet, control, 1347
- heat loss, model, water loss, predictive model, kangaroo rat, 1279
- image processing, lung, microwave radiation, 2286
- lung function, oxygen consumption, oxygen electrode, telemetry, transducer, 2106
- lung impedance, forced oscillation method, 1297
- monitoring, megamed 05.2.2.d, 2610
- respiration center**, computer, respiration control, mathematical model, 379
- respiration control**, body temperature, breathing work, compartment model, lung ventilation perfusion ratio, panting, thermoregulation, dog, 1699
 - carbon dioxide, model, grodin model, 2827
 - computer, respiration center, mathematical model, 379
- respiration quotient**, carbon dioxide, evaporation, oxygen consumption, water loss, water loss measurement, bird, lizard, 206
- respiratory distress syndrome**, computer, information processing, newborn, 3852
- respiratory tract**, dust, particulate matter, fine particle deposition, theoretical model, 3711
 - respirometry, vane principle, 228
- respiratory tract disorder**, computer, lung closing volume, determination, 1991
- respirometry**, respiratory tract, vane principle, 228
- rest**, blood pressure, exercise, heart rate, heart work, oxygen consumption, automatic measurement, 2753
- restraining device**, behavior, hearing, reaction time, tone, cat, 2245
 - cell, drug dose, skin, skin dosing cell, rat, guinea pig, 607
 - dentistry, immobilization, sling, dog, 2914
 - electric shock, stress, tail, system, free moving rat, 2965
 - microwave radiation, radiation hazard, monkey, 1438
- resuscitation**, artificial ventilation, endotracheal intubation, esophagus, esophagus obturator, 2935
- resuscitator**, artificial ventilation, newborn, positive end expiratory pressure, manual ventilation, peep device, continuous positive pressure, new device, 3709
 - first aid, hyperbarism, 3 types, comparison, reliability, 320
- reticular formation**, lateral geniculate body, mathematic model, nerve cell potential, red nucleus, spike, markov model, ventrobasal complex, 1313
- retina**, computer model, retina horizontal nerve cell, spatial integration, 1291
 - cornea, c potential, electrode, electroretinography, sclera, rabbit, 557
 - cytophotometry, retina bipolar ganglion cell, ribonucleic acid, stroboscopy, target movement, histochemistry, frog, 2632
 - electromagnetic radiation, eye, magnetic field, radiation injury, rat, ultrastructure, 254
 - electroretinography, light, temperature, combined sensor, 1519
 - evoked visual response, focal illumination, ophthalmoscopy, retina illumination, hand-held and two channel stimulator, new device, 2244
 - eye temperature, light, mathematic model, transient thermal response, 2039
 - identification, information science, mathematic model, system analysis, 2045
 - mathematic model, nerve cell network, object identification, 682
 - model, nerve cell, photoreceptor, postsynaptic receptor, presynaptic receptor, synapse transmission, 2844
 - oximetry, rabbit, 1375
- retina bipolar ganglion cell**, cytophotometry, retina, ribonucleic acid, stroboscopy, target movement, histochemistry, frog, 2632
- retina cone**, cell membrane, ion transport, ionic channel closure, turtle, 1521
 - electroretinography, electroretinography critical flicker fusion, masking, de lange curve, tree shrew, 3190
- retina correspondence**, aniseikonia, astigmatism, binocular vision, refraction, retina image, problem of distortion, 2988
- retina detachment**, computer, mathematic model, retina rupture, sclera buckling procedure, computer localisation, 2314
- retina ganglion cell**, mathematic model, nerve cell potential, retina ganglion cell potential, interspike interval

- goldfish, 2046
- etina ganglion cell potential**, mathematic model, nerve cell potential, retina ganglion cell, interspike interval, goldfish, 2046
- etina horizontal nerve cell**, computer model, retina, spatial integration, 1291
- illumination, mathematic model, synapse, uniform illumination, 493
 - mathematic model, graded potentials amplification, 484
- etina illumination**, evoked visual response, focal illumination, ophthalmoscopy, retina, hand-held and two channel stimulator, new device, 2244
- etina image**, aniseikonia, astigmatism, binocular vision, refraction, retina correspondence, problem of distortion, 2988
- computer model, eye movement, target, target point selection, 3 volunteers, 1698
 - contrast, darkness, light, mathematic model, visual system, human system, 1697
- etina lesion**, eye, laser, vision, ocular hazard, monkey, 3637
- etina macula degeneration**, evoked cortical response, evoked visual response, ophthalmoscopy, retina pigment degeneration, stroboscopy, retina macula scar, stimulator ophthalmoscope, 47 patients, 2620
- etina pigment degeneration**, evoked cortical response, evoked visual response, ophthalmoscopy, retina macula degeneration, stroboscopy, retina macula scar, stimulator ophthalmoscope, 47 patients, 2620
- image intensifier, night blindness, visual aid, 1516
- etina rod**, anisotropy, photolysis, retina rod outer segment, rhodopsin, frog, 698
- mathematic model, current spatial distribution, rod cell potential, frog, 85
- etina rod outer segment**, anisotropy, photolysis, retina rod, rhodopsin, frog, 698
- rhodopsin, visual adaptation, simple equivalent, circuit analysis, 3535
- etina rupture**, computer, mathematic model, retina detachment, sclera buckling procedure, computer localisation, 2314
- etinoblastoma**, computer assisted tomography, exophthalmos, eye foreign body, lens luxation, orbit tumor, 33 cases, 2742
- echooculography, exophthalmos, melanocytoma, optic nerve coloboma, vitreous body hemorrhage, new equipment, manual compound scanning, 1100
- etinoscopy**, accommodation, eye movement, book retinoscopy, 1515
- etinula cell**, light, ultraviolet radiation, fly, retinula, 1514
- etractor**, nerve section, optic nerve, nerve viewing and sectioning, rat, 667
- etrieval system**, computer, dream content, no coding, 2309
- computer program, medical record, mumps, 2366
 - data base, medical record, model, indexing, 1608
 - data base, literature, medlars, request analysis, medline, 1607
 - data base, medical documentation, medical literature, query system, 3468
 - data base, information processing, medical documentation, model, postgraduate education, medlars, medline, index medicus, usa, problem oriented medical data, 2751
 - digital computer, literature, medical record, review, 836
 - medical record, radiology, speech, patient name, 3012
 - medical record, computer language, pdp 10, 1979
 - term relevance, 3091
- etroperitoneal cancer**, chorionic gonadotropin, computer assisted tomography, alpha fetoprotein, testis cancer, 4 cases, 3822
- etroperitoneal disease**, computer assisted tomography, endoscopic retrograde cholangiopancreatography, kidney disease, liver disease, liver scintiscanning, pancreas disease, tomography, 359
- etroperitoneal hematoma**, anticoagulant agent, computer assisted tomography, femoral neuropathy, 2 case reports, 3060
- etroperitoneal space**, computer assisted tomography, survey, 3070
- eye syndrome**, ammonium, aspartate aminotransferase blood level, brain edema, computer, electroencephalography, encephalopathy, exchange blood transfusion, fatty liver, furosemide, mannitol, 7 children, 779
- rhabdomere**, compound eye, misalignment, flies, 1292
- rheology**, age, arthritis, arthrosis, sex, synovial fluid, human, 3519
- angiography, blood flow, magnetorheography, dog, 3753
 - artery flow, atherosclerosis, coronary artery, coronary artery blood flow, mathematic model, pulsatile flow, flow analysis, 2454
 - blood flow, blood-pressure, capillary flow, infrared radiation, 3288
 - liver, liver cirrhosis, cattle, pig, 1837
 - semen, human semen, 3318
- rheumatic disease**, acupuncture, laser, akuplas device, 2898
- rheumatoid arthritis**, computer assisted diagnosis, keratoconjunctivitis sicca, 3420

- knee, knee instability, mediolateral stability knee analyser, 2795
- rhinopharynx cancer**, computer assisted tomography, face, mucocoele, paranasal sinus, skeleton, 1962
 - computer assisted tomography, face cancer, skull base cancer, 50 cases, 3442
- rhinopharynx tumor**, computer assisted tomography, juvenile hemangiofibroma, 3 cases, 3458
- rhodopsin**, anisotropy, photolysis, retina rod, retina rod outer segment, frog, 698
 - calcium adenosine triphosphatase, cell membrane, lipid membrane, membrane protein, 404
 - retina rod outer segment, visual adaptation, simple equivalent, circuit analysis, 3535
- rhythmic activity**, mathematic model, nerve cell network, spike, snail, 1728
- rib**, mathematic model, anatomical model, 3134
- ribonuclease**, antigen protein, chemical kinetics, enzyme, ribonucleic acid, ultrasonics, ultrasonic cavitation, 203
- ribonucleic acid**, antigen protein, chemical kinetics, enzyme, ribonuclease, ultrasonics, ultrasonic cavitation, 203
 - cytophotometry, retina, retina bipolar ganglion cell, stroboscopy, target movement, histochemistry, frog, 2632
- risk**, aerosol, asepsis, bacterial pollution, bronchial asthma, fungus, infection, 27 apparatuses, 18 subjects, mobile use, 1478
- risk factor**, accident, automobile industry, car driving, cost benefit analysis, safety, usa, 1529
 - computer program, follow up, life table, population model, survival rate, 1637
- roentgen**, radiography, device for testing accuracy, 1537
- roentgen analysis**, bladder, chloride, freeze drying, potassium, skin, sodium, soft tissue, frog, toad, 2860
 - electron probe, eye foreign body, eye injury, foreign body localization, perforating eye injury, case report technique, 2255
- roentgen apparatus**, aluminum, brems radiation, 60-140 kv, 725
 - beam profile, dosimetry, roentgen dose distribution, star test pattern, 315
 - dentistry, roentgen tube, 3780
- roentgen dose distribution**, atomic number, nuclear radiation, photon absorption, radiation absorption, radiation scattering, radiotherapy, 727
 - beam profile, dosimetry, roentgen apparatus, star test pattern, 315
 - beam profile, cancer, pion radiation, radiotherapy, 3431
 - bone, dosimetry, megavoltage radiotherapy, radiation attenuation, 2096
 - californium 252, dosimetry, ionization chamber, liquid dielectric ionization chamber, 300
 - cancer, computer, neutron therapy, radiotherapy, G.D.R., 1976
 - cancer, computer, radiotherapy, 3064
 - cat, cobalt therapy, dosimetry, phantom, tissue inhomogeneities, 3432
 - computer, radioisotope therapy, computerization of afterloading system, 1958
 - computer, contouring device, radiotherapy, computer compatible, 1917
 - dosimetry, negative pion radiation, radiotherapy, 1127
 - electron, magnetic field, phantom, depth dose, 1419
 - fast electron therapy, thorax, small angle pendulous radiotherapy, 741
 - fast electron therapy, magnetic enhancement, 3252
 - filter, hodgkin disease, radiotherapy, tissue compensating filter, moire topography, 307
 - linear energy transfer, neutron radiation, phantom, pion radiation, radiotherapy, 1198
 - negative pion radiation, radiation detection, radiation field, charge collector, 3567
- roentgen film**, SEE x ray film
- roentgen generator**, computer, micro computerized generator, 2355
 - output measurements, voltage shape, 1013
- roentgen picture**, radiography, source coding, 3769
- roentgen radiation**, air pollution, digital computer, fluorescence, multichannel analyzer, serum, 3277
 - attenuation, gamma radiation, extrapolation, biologic material, 2665
 - beta radiation, dosimetry, phantom, gamma radiation, radiotherapy, tissue equivalent, 2928
 - cat, 3781
 - cell membrane, cell shape, image processing, protein, electron microscopy, 3221
 - cell survival, fast neutron radiation, negative pion radiation, 3203
 - chemotracer, fluorescence, compton scattering, 586
 - computer assisted tomography, densitometry, gamma radiation, radiation scattering, compton scatter, 810
 - computer assisted tomography, ionization chamber, radiation detection, xenon, fan beam computed scanner, 3810
 - computer assisted tomography, signal noise ratio, 1199
 - computer assisted tomography, radiation transmission, 1182
 - computer assisted tomography, image processing, 1217
 - computer assisted tomography, image processing, radiography, scintigraphy, scintillation camera, calculus, 2348
 - conization chamber, image processing, multiwire chamber, 314
 - dosimetry, megavoltage radiotherapy, radioactivity, 45 mv, 732
 - fluorescence, imaging system, imaging system evaluation, 2661

- focal point, modulation transfer function, 93
- fourier transform, holography, 4.48 nm xrays, 1125
- image, transducer, charge-coupled device, 1778
- image intensifier, television, roentgen diffraction, 3786
- image intensifier, radiography, 3772
- image intensifier, radiography, image contrast, sienens pantoskop 3, 1532
- image processing, radiography, visual system, soft roentgen radiation, mirror, 3027
- image quality, radiography, total unsharpness, 303
- ionization chamber, model, radiography, energy dependence, 3665
- megavoltage radiotherapy, radiation detection, silicon diode, compensating shield for diode, 2663
- nerve cell membrane potential, nerve cell membrane resistance, snail, 2074
- radiation dose fractionation, skin, skinfold, stiffness, rupture, split dose, effects, rats, 1272
- spectrometry, 5-200 kev, 588
- roentgen screen**, radiation energy, x ray film, screen film system speed, 2251
- roentgen tube**, dentistry, roentgen apparatus, 3780
 - dosimetry, mammography, transmolybdenum tube, 3763
 - focal point, image processing, radiography, 317
 - radiation detection, radiography, kvp measurement, digital readout, 3664
 - toshiba rotating anode, 1126
- rotation**, ankle, anterior tibial muscle, electromyography, foot, gastrocnemius muscle, joint, soleus muscle, sinusoidal torque, human, 895
 - mathematic model, oscillation, vestibular system, phase characteristic, phase lead, 3133
- running**, athlete, model, work, negative work, running speed, 6 athletes, 3516
 - energy, muscle performance, walking, work, level walking, 1121
- r wave**, computer, electrocardiography, heart left ventricle ejection fraction, qrs complex, q wave, relation qrs forces to left ventricle ejection fraction, 2699
- saccadic eye movement**, computer, eye movement, rapid eye movement, analysis, 3855
 - eye movement, mathematic model, nystagmus, 2477
- safety**, accident, fatigue, human factors research, industry, human error, pattern analysis, ortho oblique type binary data decomposition, 717
 - accident, research, model, 3500
 - accident, automobile industry, car driving, cost benefit analysis, risk factor, usa, 1529
 - accident prevention, college, education, university, curriculum, safety professional, model, 1830
 - computer, cost, electrocardiography, monitoring, physician, over and underutilization, contribution to diagnosis, task force, 2701
 - conductivity, electric accident, floor covering, gas discharge, medical instrumentation, 2292
 - coronary care unit, electric accident, emergency ward, hospital, intensive care, labor room, operating room, recovery room, maryland lutheran hospital, 502
 - electric device, alternating current plug, test, inspection, 943
 - traffic accident, decision theory model, environmental safety improvement, danger compensation, 2010
- sailor**, breathing rate, electrocardiography, heart rate, lung ventilation, ship, skin temperature, telemetry, workload, seagoing ship, 524
- salicylic acid**, carrageen, inflammation, paw edema, edema measurement method, rat, 3679
- saliva**, sampling, plastic collection device, saliva collection, 3271
- saltatory conduction**, cable, model, myelination, nerve fiber, test theory, 1727
- samarium 153**, densitometry, lung congestion, lung density, lung edema, radiation, gamma radiation, 1332
- sample holder**, cryogenics, microscopy, 2507
 - electron microscopy, philips em 300s, 2874
 - microscopy, specimen stretcher, 537
 - nuclear magnetic resonance, multiple pulse angle spinning, 2154
 - suspension, viscometry, 553
- sampling**, averaging, trigger, time jitter, 1789
 - cancer, population model, statistics, survival, truncated data, censored sample, 2403
 - computer assisted tomography, image processing, arbitrary sampling, 3779
 - diagnosis, statistics, expert estimate, 24
 - digital computer, signal processing, 135
 - electron microscopy, oscilloscope, scanning electron microscopy, 3594
 - fourier transform, procedure, 880
 - fourier transform, evaluation, 879
 - information processing, alias free, 3127
 - saliva, plastic collection device, saliva collection, 3271
 - analog digital convertin, 1356

- sarcoidosis**, computer assisted tomography, lung, sarcoidosis, 6 cases, 2356
- sarcomere**, computer, light diffraction, muscle contraction, muscle fiber, muscle tetanic contraction, frog, in vitro, 2373
 - diffractometer, light diffraction, muscle, muscle contraction, muscle length, photodiode, sarcomere length determination, 3362
 - digital computer, light diffraction, muscle fiber, refraction index, ccd, 177
- sarcoplasmic reticulum**, adenosine triphosphate, calcium pump, cell membrane, 405
 - cell membrane conductance, membrane potential, phospholipid membrane, 3501
- sartorius muscle**, muscle water, nuclear magnetic resonance, oxygen isotope, transverse longitudinal resonance, frog, 3201
- satellite**, antenna, electromagnetic field, telemetry, 2107
- satiety**, body weight, computer model, hunger, review, computer simulation, control mechanism, 867
- satisfaction**, hearing aid, questionnaire, analysis, 3336
- sawing**, bone, osteotomy, ultrasonics, welding, surgery, autopsy, rabbits, 1018
- scala tympani**, acoustic nerve, cochlea, electrode, electrostimulation, nerve survival, stimulation pattern, cat, 3339
- scalp**, cardiotocography, electrode, fetus, fetus monitoring, stainless steel, fine stainless steel wire, 100 cases, 3395
 - computer assisted tomography, electroencephalography, frequency analysis, 350 intracerebral organic lesions, 3425
 - electrode, electroencephalography, mathematic model, meninx, 2469
- scalpel**, bone, midas rex, pneumatic device, 2680
- scanning electron microscopy**, autoradiography, beta emitter, location of beta emitter, 1017
 - calcification, calcium blood level, electron microscopy, serum, 204
 - diffusion, electron microscopy, heavy atoms, 982
 - electron microscopy, specimen, surface variation, 1364
 - electron microscopy, stage control, 133
 - electron microscopy, signal noise ratio, 2513
 - electron microscopy, resolving power, 1775
 - electron microscopy, oscilloscope, sampling, 3594
 - electron microscopy, specimen holder, etec corporation, cyclic loading, 3593
 - electron microscopy, alignment, 2502
 - electron microscopy, signal noise ratio, channel plate multiplier, 1783
- scanning microscopy**, electric interference, electron microscopy, magnetic field, ac field compensation, 129
 - image processing, laser, microscopy, 2505
 - image processing, microscopy, 1785
 - microscopy, 2148
- scattering**, blood, echography, sound, ultrasonics, 1285
- scavenger**, anesthetic equipment, automotive exhaust, child anesthesia, waste gases see exhaust gases, 1136
- schilder disease**, alcoholism, alzheimer disease, brain atrophy, computer assisted tomography, dementia, multiple sclerosis, parkinson disease, progressive multifocal leukoencephalopathy, survey, 358
- schizophrenia**, brain blood flow, brain cortex, consciousness, frontal lobe, xenon 133, review, 49 references, 1074
 - computer, computer assisted diagnosis, diagnosis, computer vs clinician, 760
 - hospital, maladjustment, medical record, mental disease, neuroleptic agent, adolescent, 2369
- sciatic nerve**, capsule, endoneurium pressure, interstitial fluid, lead, nerve fiber, polyethylene, rat, 151
- scintiangiocardigraphy**, computer, macroaggregated albumin technetium 99m, scintillation camera, videorecording, 3818
 - computer, heart left ventricle ejection fraction, heart left ventricle performance, heart scintigraphy, 25 cases, 2332
 - generator, iridium 191, iridium 191m, osmium 191, improved generator, ir 191m application in monkey, 1333
- scintiscisternography**, cerebrospinal fluid, computer assisted tomography, hydrocephalus, normotensive hydrocephalus, penthanil yb 169, subarachnoid hemorrhage, 54 cases, 2721
- scintigraphy**, ad converter, computer interface, digital computer, image processing, scintillation camera, 3014
 - brain, digital filtering, heart infarction, image processing, scintillation camera, thermography, 1929
 - camera, mathematic model, modulation transfer function, scintillation, statistics, 1921
 - cancer, computer model, image processing, information processing, normal brain, 2341
 - computer, archive storage, heidelberg, 1974
 - computer, scintillation camera, system for clincom apparatus, 1972
 - computer, digital computer, image processing, information processing, 1576
 - computer assisted tomography, digital filtering, image processing, e filter, 2 dimensional filter, 825
 - computer assisted tomography, gamma radiation, stochastic model, 1016
 - computer assisted tomography, fourier transform, image processing, gamma radiation, 1218

- computer assisted tomography, image processing, signal noise ratio, image restoration, 2362
- computer assisted tomography, image processing, radiography, roentgen radiation, scintillation camera, calculus, 2348
- hematology, mathematic model, gamma radiation, radioisotope, 2465
- image processing, iodine 123, scintillation camera, 729
- image processing, optical lens, radiography, fresnel zone plate, 2512
- image processing, gamma radiation, radioisotope, 1918
- image processing, gamma radiation, radiocardiography, radioisotope, technetium 99m, 3378
- lung clearance, mathematic model, radioactive aerosol, lung burden, detector of adjustable response, 1063
- photomultiplier, rca 8850/8575, gain stability, 3573
- gamma radiation, scintillation camera, mobile camera, 311
- gamma radiation, scintillation camera, orthogonal light propagation, 304
- radiology, scintillation camera, quality control, 733
- statistics, photon counter, zero crossing distribution, 1397
- scintillation**, atmosphere, environment, mechanism, turbulence, 16
 - atmosphere, environment, 171
 - camera, mathematic model, modulation transfer function, scintigraphy, statistics, 1921
- scintillation camera**, ad converter, computer interface, digital computer, image processing, scintigraphy, 3014
 - blood flow, computer, radiocardiography, 131 cases, 2349
 - bone scintigraphy, imaging system, cleon imager, case series, 2155
 - brain, digital filtering, heart infarction, image processing, scintigraphy, thermography, 1929
 - brain blood flow, computer, xenon 133, methods, 3063
 - brain blood flow, brain infarction, brain scintigraphy, brain tumor, camera, hydrocephalus, subdural hematoma, method, diagnosis, 190
 - brain scintigraphy, computer assisted tomography, heart infarction, technetium 99m, 25 cases, dog heart infarction, emission computed tomography, maac 99m, 1200
 - clearance, hippuric acid i 125, method, 1874
 - collimator, scintiscanning, hybrid scanner, 2271
 - collimator, phantom, dynamic studies, 305
 - computer, macroaggregated albumin technetium 99m, scintiangiocardiography, videorecording, 3818
 - computer, camera deadtime correction, 1605
 - computer, scintigraphy, system for clincom apparatus, 1972
 - computer, krypton 81m, lung ventilation, mathematic model, clinical examples, lung ventilation measurement, 1475
 - computer, lung, lung disease, mathematic model, washout curve, xenon 133, and normals, 380
 - computer, hippuric acid i 125, renal plasma flow, rat, 1069
 - computer assisted tomography, humongotron, 1597
 - computer assisted tomography, edetate gallium ga 68, positron scintiscanning, technetium 99m, emission computer assisted tomography, comparison, 1177
 - computer assisted tomography, image processing, radiography, roentgen radiation, scintigraphy, calculus, 2348
 - computer assisted tomography, computer program, modulation transfer function, tomoscintigraphy, evaluation of depth effect, 2347
 - image processing, iodine 123, scintigraphy, 729
 - model, window, effect window fraction, deadtime correction, 1424
 - gamma radiation, scintigraphy, mobile camera, 311
 - gamma radiation, scintigraphy, orthogonal light propagation, 304
 - radiology, scintigraphy, quality control, 733
 - resolution, survey, 2570
 - camera study device, 1133
- scintillation counting**, cerenkov radiation, automatic control system, 3249
 - photon, 1822
- scintillator**, gamma radiation, zinc sulfide, fast decay, 1821
- scintiscanning**, collimator, scintillation camera, hybrid scanner, 2271
 - computer, thin layer chromatography, pdp 12, 754
 - computer, parathyroid gland, parathyroid scintiscanning, pertechnetic acid tc 99m, radium, toluidine blue i 131, preoperative localization, 3440
 - computer assisted tomography, positron emitter, principles, 1957
 - display system, image display, 3671
 - image processing, motion picture, film choice, 2571
 - rectilinear scintiscanning, uptake probe, 2905
 - telephone telemetry, telephone line transmission, 1768
- sclera**, cornea, c potential, electrode, electroretinography, retina, rabbit, 557
 - eye surgery, stiletto, sclera plug, new devices, 1553

- sclera buckling procedure**, computer, mathematic model, retina detachment, retina rupture, computer localisation, 2314
 - eye surgery, silicone, stretcher, sponge implant, new device, 3397
- scleroderma**, esophagus achalasia, esophagus peristalsis, esophagus pressure, gastrointestinal motility, gastrointestinal tract, pressure transducer, 1351
- scoliosis**, milwaukee brace, treatment, 1900
- screening test**, multiphasic testing, periodic medical examination, preventive medicine, principals for application, usa, 604
- seat**, acceleration, body posture, impact, intervertebral disk, model, musculoskeletal model, 3138
 - body cast, orthopedics, prosthesis, wheelchair, body cast vacuum form method, 280
- sediment**, lake water, mathematic model, polychlorinated biphenyl, lake michigan, material balance study, 1244
- seizure**, brain cortex, electroencephalography, electroencephalography electrode, laminar exploration, skin film technology, 555
 - brain depth stimulation, brain edema, electrode, electrode impedance, glucocorticosteroid, mannitol, somatomotor epilepsy, visual cortex, cat, 1489
 - brain hematoma, brain tumor, computer assisted tomography, headache, head trauma, hydrocephalus, mental deficiency, 795
 - mathematic model, nerve cell network, spatiotemporal pattern, 1327
- selective amplifier**, active filter, 2484
 - active filter, 1763
 - electric filter, notch filter, 512
 - temperature, stability, 3575
 - 510
- self medication**, behavior, method, rat, pneumatic syringe, 2968
- sella turcica**, aneurysm, endoscopy, hypophysis adenoma, lumbar disk, telescope, endoscopy, apparatus, neurosurgery, hopkins telescope, 666
 - brain arachnoid cyst, computer assisted tomography, hydrocephalus, pneumoencephalography, third brain ventricle, case report, man of 19, neurosurgery, 1588
 - brain infarction, brain tumor, computer assisted tomography, skull base, sagittal and coronal scan, 3824
 - computer assisted tomography, hypophysis adenoma, parasellar tumor, empty sella, 1188
- sella turcica tumor**, brain angiography, brain tumor, computer assisted tomography, hypophysis tumor, ophthalmology, parasellar tumor, pneumoencephalography, false negative diagnosis, 4 cases, 818
 - brain angiography, brain artery aneurysm, brain scintigraphy, computer assisted tomography, pneumoencephalography, sellar and parasellar lesions, 76 in 5000 cases, 2731
- semen**, rheology, human semen, 3318
- semicircular canal**, computer model, nerve cell potential, pigeon, 2416
 - cupula, mathematic model, otolith, sensation interaction, 436
 - hydrodynamics, mathematic model, utricle, fluid flow, 440
 - pad, vestibular system, computer, impulse weight function, frog, 3356
- semiconductor**, active filter, circuit design, CMOS active-R filter, 2101
 - diode, nuclear magnetic resonance, calibration, 1010
 - fat, model, pacemaker nerve cell, potassium channel, tetrodotoxin, 926
 - generator, vo2 transition metal oxide, 1357
 - integrator, photoelectric cell, photometry, 175
 - laser, photometry, photoresistor, stannic oxide, 3645
 - microwave radiation, power amplifier, 108
 - ph electrode, review, gas sensor, 144
 - photoelectric cell, output recording circuit, 1756
- sensory nerve**, nerve potential, pain, tooth, recording method, 674
 - nerve stimulation, powered prosthesis, tactile discrimination, vibration, human, 1902
- sensory system**, frequency analysis, mechanoreceptor, nonlinear analysis, insect, 1329
- serotonin**, body temperature, dopamine, electric field, hyperthermia, hypothalamus, microwave radiation, noradrenalin, rat, 2579
- serum**, acid phosphatase, automation, 1171
 - air pollution, digital computer, fluorescence, multichannel analyzer, roentgen radiation, 3277
 - calcification, calcium blood level, electron microscopy, scanning electron microscopy, 204
 - carbon dioxide, carbon dioxide electrode, carbonic acid, plasma, potentiometry, 1393
 - triglyceride, lutermethod comparison, automation, 3046
- serum albumin**, computer program, drug protein binding, ligand, thyroxine, 1153
- serum colloid osmotic pressure**, blood viscosity, catheter, manometry, continuous measurement, 212
- serum nonesterified fatty acid**, automatic determination, 3795
- serum protein**, aluminum silicate, biocompatibility, teflon, thrombocyte adhesiveness, 2001
 - blood viscosity, capillary permeability, hematocrit, mathematic model, 3541
- servocircuit**, clamp, heart ventricle enddiastolic volume, heart ventricle endsystolic volume,

heart ventricle pressure, heart ventricle volume, isolated heart, pump, volume clasper, dog, 3290

sewage treatment, automation, medical instrumentation, water treatment, netherlands, 3208

sex, age, femur shaft, structure strength, 37 human, 892

- age, arthritis, arthrosis, rheology, synovial fluid, human, 3519
- age, biomechanics, skin, living skin, tension extension ratio, human, 1910
- age, brain ventricle, computer assisted tomography, 170 examinations, age, sex, 3444
- gait, walking aid, sex recognition, dynamic point light display, human, 1901

sex chromosome aberration, computer, inheritance, vectorcardiography, semiautomatic procedure, 770

sex identification, forensic science, frequency analysis, larynx prosthesis, speech spectrography, vocal system, 12 volunteers, experimental study, 3107

sexual arousal, cassette recorder, electrocardiography, electroencephalography, physiology, plethysmography, sexuality, vagina, vaginal photoplethysmography, cassette recorder, 1883

sexual behavior, behavior, computer model, model, newt, 395

- computer model, digital computer, motivation, male rat, 2393

sexuality, cassette recorder, electrocardiography, electroencephalography, physiology, plethysmography, sexual arousal, vagina, vaginal photoplethysmography, cassette recorder, 1883

shape discrimination, computer assisted tomography, image processing, pattern recognition, circle transform, 2339

shear rate, blood viscosity, glass capillary, different shear rates, 3170

- elasticity, flow, lecithin, mathematic model, suspension, viscosity, 1710

shear stress, articular cartilage, cartilage, femur, viscoelasticity, rabbit, 38

- blood vessel, mathematic model, shear strength, blood vessel radii, 447
- elasticity, femoral vein, jugular vein, dog, 2793
- heart valve, heart valve prosthesis, flow, 1855

shield, microwave radiation, 2565

ship, breathing rate, electrocardiography, heart rate, lung ventilation, sailor, skin temperature, telemetry, workload, seagoing ship, 524

shock, pneumatic splint, 47 patients, pneumatic trousers, 3287

shoe, biomechanics, portable force measuring device, 281

short circuit current, pressure, skin potential, pressure jump relaxation kinetics, frog, 1738

shutter, camera, shutter control, 536

sigmoidoscopy, colon disease, endoscopy, 139 patients, diagnosis, flexible versus rigid sigmoidoscope, 1033

signal, data transmission, telemetry, d.c directional coupler, 961

signal detection, averaging, radiation injury, optimal use, 3836

- decision, information processing, noise, vision, multiple channel, human, 1694
- decision theory, statistics, 3119
- electrocardiography, interference, signal noise ratio, high frequency ecg, 1749
- face, recognition, vision, 28 volunteers, 3722
- information processing, signal noise ratio, signal processing, detector array, 3126
- information processing, signal processing, statistics, 3125
- microwave radiation, nuclear magnetic resonance, slotted resonator, 1417
- photoacoustic spectroscopy, piezoelectricity, 3210
- signal noise ratio, 2025

signal noise ratio, ad converter, interference suppression, 3605

- algorithm, image processing, vision, visual resolution, 1925
- amplifier, photodiode, 518
- amplifier, cryogenics, fet semiconductor, microwave radiation, 107
- amplifier, photodiode, feedback, 1410
- amplifier, cooling, radioreceiver, 1762
- amplifier, cryogenics, nuclear magnetic resonance, 2153
- amplifier, bolometer, electromagnetic radiation, 2147
- antenna, telemetry, 964
- auditory masking, hearing, tone, 454
- auditory masking, intelligibility, interrupted speech, 62
- auditory masking, hearing, pattern recognition, pure tone, 2820
- auditory system, computer model, evoked cortical response, human, 3483
- brain cortex, nerve cell potential, signal processing, spike train, extracellular recording, 2083
- cell membrane potential, differential amplifier, epithelium, 2886
- chemical kinetics, nonlinear system, 414
- computer assisted tomography, roentgen radiation, 1199
- computer assisted tomography, image processing, scintigraphy, image restoration, 2362
- data transmission, image processing, telephone telemetry, television, 1930
- deafness, hearing, intelligibility, masking, 657
- deafness, hearing aid, intelligibility, noise, speech discrimination, 34 patients, peak clipping, automatic gain control, 1930

control, 2628

- diode, mixing, receiver, telemetry, 119
- electrocardiography, fetus, real time ecg, 480
- electrocardiography, interference, signal detection, high frequency ecg, 1749
- electrocardiography, fine structure analysis, 2941
- electrocardiography, electromagnetic radiation, telemetry, los angeles, 1359
- electroencephalography, 1745
- electroencephalography, evoked response, preamplifier, 1891
- electromyography, isometric muscle contraction, filtered emg, 1001
- electron microscopy, scanning electron microscopy, 2513
- electron microscopy, scanning electron microscopy, channel plate multiplier, 1783
- embryo, heart muscle fiber, membrane potential, microelectrode, intercellular communication, 1742
- fet semiconductor, mathematic model, 2485
- hearing, intelligibility, speech, amplitude compression, 65
- hearing impairment, perception deafness, speech, speech intelligibility, 1288
- heart sound, microphone, phonocardiography, 1058
- holography, vibration, vibration analysis, 573
- image processing, signal dependent noise, 1927
- image processing, image expansion, 3595
- information processing, signal detection, signal processing, detector array, 3126
- intelligibility, speech, speech enhancement, 3533
- lock in amplifier, cycle slip detectors, 1764
- mathematic model, microphone, microphone array, 194
- microelectrode, nerve cell potential, nerve fiber potential, chronic recording, tube electrodes, 559
- noise, noise evaluation, 30
- pattern recognition, distorted pattern, 1776
- signal detection, 2025
- speech intelligibility, linear prediction, speech synthesis, 1442

signal processing, analog computer, computer memory, delay line, ccd, 984

- averaging, electroencephalography, parameter extraction, 1753
- brain cortex, nerve cell potential, signal noise ratio, spike train, extracellular recording, 2083
- cochlea, coding, correlation function, hearing, mathematic model, reverse correlation technique, 3154
- computer, digital computer, eye movement, one line analysis, human, 1229
- computer, digital filtering, online digital filter, 2118
- computer, electroencephalography, daily routine, 2710
- digital computer, sampling, 135
- digital computer, minicomputer, oscilloscope, 3228
- digital filtering, statistics, 3574
- disabled, electromyography, information processing, prosthesis, 1744
- doppler ultrasound flow meter, fourier transform, image processing, convolution method, 3028
- echo, hearing, intelligibility, spectrometry, speech, 2819
- electroencephalography, evoked response, spectrometry, wave, 1740
- electroencephalography, monitoring, surgery, 1140
- hearing, model, nonlinear system, residuum, 2818
- information processing, signal detection, signal noise ratio, detector array, 3126
- information processing, signal detection, statistics, 3125
- information processing, microprocessor, differential equation, 2879
- latent period, motor nerve, nerve conduction, transfer, 1751
- nerve cell, nerve cell potential, nonlinear system, 1741

silastic, acetal, biocompatibility, cell culture, cytotoxicity, nylon, plastic, polyethylene, polystyrene, polyurethan, teflon, testing, 866

- arteriovenous shunt, biocompatibility, blood clotting, oxygenator, polysiloxane, thrombocyte count, lamb, 1869
- blood, oxygenation, tube, complex geometry, helical coil, 629

silicon diode, dosimetry, linear accelerator, megavoltage radiotherapy, radiation detection, 2664

- fast neutron radiation, neutron dosimetry, in vivo dosimetry, 743
- megavoltage radiotherapy, radiation detection, roentgen radiation, compensating shield for diode, 2663
- megavoltage radiotherapy, neutron detection, photon, electron response, 3562

silicon dioxide, bone piezoelectric potential, ceramics, cortical bone, dielectric constant, titanin acid, ultrasonics, human, 75

silicone, eye surgery, sclera buckling procedure, stretcher, sponge implant, new device, 3397

- force transducer, gastrointestinal tract, strain gauge transducer, contraction, implantation, water proof, 2918

silver, electrode, silver chloride, submaxillary gland, voltage clamp, rabbit, 3233

silver chloride, electrode, silver, submaxillary gland, voltage clamp, rabbit, 3233

simulator, aorta balloon, aorta valve prosthesis, assisted circulation, cardiovascular system, korotkow sound, design, performance, 2177

- biomechanics, knee, knee prosthesis, knee joint simulator, 3004
- cardiovascular system, mathematic model, simulation requirement, 2176

sine triangle converter, sine wave generator, tri wave generator, 2102

sine wave generator, computer memory, low frequency generator, digital generator, 959

- operational amplifier, 2490
- sine triangle converter, tri wave generator, 2102

sine wave stimulation, brain depth stimulation, solid state, 2624

sinus node, artificial heart pacemaker, electrode, mediastinum, transmediastinal atrial sensing electrode placement, atrial programmed pacemaker, 31 cases, 1053

- heart automaticity, heart rhythm, mathematic model, weakly coupled relaxation oscillators, 2473
- mathematic model, model, modulator, pulse frequency modulator, 3183
- intercellular coupling, rabbit, 3197

sister chromatid exchange, chromosome analysis, computer analysis, exchange frequency, automatic measurement, 2301

sitting, behavior, centrifuge, gravity, non linear properties, upright sitting human body, driving point impedance, 2652

- body posture, cerebral palsy, chair, electromyography, ergonomics, method, 284

skeleton, aviation, bone density, helicopter pilot, vibration, skeletal system, response, 3010

- computer assisted tomography, face, mucocoele, paranasal sinus, rhinopharynx cancer, 1962
- computer program, jaw, photography, medial axes, algol, 1973

skeleton roentgenography, image quality, magnification radiography, 180 cases, 734

skin, age, biomechanics, sex, living skin, tension extension ratio, human, 1910

- aminoacid, chromatography, electrophoresis, thin layer chromatography, urea, method, device, 3746
- artificial skin, back, disabled, hand prosthesis, touch, 1908
- beam profile, cobalt therapy, dosimetry, skin test, 3373
- biophysics, epidermis, thermodynamics, nondestructive measurement, 3151
- bladder, chloride, freeze drying, potassium, roentgen analysis, sodium, soft tissue, frog, toad, 2860
- bulla, exudate, histamine, inflammation, kinin, prostaglandin, recovery, method, 3363
- burn, evaporation, heat radiation, mathematic model, temperature distribution, 2040
- cell, drug dose, restraining device, skin dosing cell, rat, guinea pig, 607
- defibrillation, electrode, electrode paste, thorax impedance, paddle electrode paste, comparison, 2190
- deprivation, mathematic model, finite deformation theory, 2035
- electrode, skin impedance, electrodes, influence, 2888
- electromagnetic field, thermodynamics, measurements, review, 2429
- electrostimulator, pain, skin defect, 694
- energy transfer, masking, human, 3747
- epidermis, slices, comparative thickness, weight, rat skin, 293
- radiation dose fractionation, roentgen radiation, skinfold, stiffness, rupture, split dose, effects, rats, 1272
- skin conductance, skin potential, relation, structure, physiologic state, 2463
- skin receptor, residual and reverse masking, energy dependence, human, threshold stimulus, 2983
- tension, measurement, low-pressure suction device, 2414
- viscoelasticity, ballistometer, 46 normal subjects, 2415

skin abrasion, artifact, electrocardiography, electroencephalography, model, skin dystrophy, skin injury, skin potential, sweating, transcutaneous stimulation, wound healing, 3234

- artifact reduction, electrocardiography, electroencephalography, movement, skin electrode, 1389

skin blood flow, 6 plate recording element, 226

skin burn, defibrillation, mathematic model, model, skin conductance, defibrillator default, human, 450

- diathermy, thermometry, diathermic microthermometry, 3745

skin capillary, atherosclerosis, capillary flow, diabetes mellitus, hypertension, microscopy, television, vital television capillary microscopy, 3285

- capillary flow, pulsatile flow, flow measurement, 1383

skin conductance, aviation, electrocardiography, electroencephalography, electromyography, respiration, inexpensive recording method, 296

- defibrillation, mathematic model, model, skin burn, defibrillator default, human, 450
- electrocardiography, monitory, pulse, transducer, volume, multifunction transducer, 1142
- habituation, orienting reflex, 2618
- model, square wave stimulator, stimulation, transcutaneous stimulation, 2549
- skin, skin potential, relation, structure, physiologic state, 2463
- wheatstone bridge, 4 electrode methods, resistance measurement, 1392

skin defect, electrostimulator, pain, skin, 694

skin dystrophy, artifact, electrocardiography, electroencephalography, model, skin abrasion, skin injury,

- skin potential, sweating, transcutaneous stimulation, wound healing, 3234
- biomechanics, method, 2804
- skin elasticity**, incision, surgery, excision, 1555
- radiotherapy, in vivo measurements, apparatus, 2646
- skin electrode**, artifact reduction, electrocardiography, electroencephalography, movement, skin abrasion, 1389
- artificial heart pacemaker, electrode, stimulation, thorax wall, external pacemaker, stimulation through subcutaneous pin electrodes, 2192
- b potential, electroretinography, evoked visual response, normal subjects, 3357
- skinfold**, body temperature, noninvasive measurement method, 207
- radiation dose fractionation, roentgen radiation, skin, stiffness, rupture, split dose, effects, rats, 1272
- skin impedance**, electrode, skin, electrodes, influence, 2888
- skin injury**, artifact, electrocardiography, electroencephalography, model, skin abrasion, skin dystrophy, skin potential, sweating, transcutaneous stimulation, wound healing, 3234
- skin oxygen tension**, arterial oxygen tension, monitoring, newborn, oxygen tension electrode, 3633
- skin permeability**, bladder wall permeability, epithelium, xenon 133, in vitro, water boundary layer, frog, 2012
- cesium 137, diffusion, epidermis, strontium 89, role, 292
- computer model, epidermis, sodium, frog, 870
- skin potential**, artifact, electrocardiography, electroencephalography, model, skin abrasion, skin dystrophy, skin injury, sweating, transcutaneous stimulation, wound healing, 3234
- pressure, short circuit current, pressure jump relaxation kinetics, frog, 1738
- skin, skin conductance, relation, structure, physiologic state, 2463
- skin receptor**, mechanoreceptor, receptor potential, potential recording, insect, 2256
- skin, residual and reverse masking, energy dependence, human, threshold stimulus, 2983
- skin resistance**, SEE skin conductance
- skin temperature**, blood flow, body temperature, heart output, mathematic model, transient response, human, thermoregulation, 448
- blood pressure, cooling, finger, raynaud phenomenon, pressure measurement, human, 2208
- brain ischemia, sympathetic nerve, thermography, new apparatus, 2563
- breathing rate, electrocardiography, heart rate, lung ventilation, sailor, ship, telemetry, workload, seagoing ship, 524
- protective clothing, thermoregulation, water cooling, water perfused suit, 1440
- skin test**, beam profile, cobalt therapy, dosimetry, skin, 3373
- skull**, bone piezoelectric potential, osteon, piezoelectricity, 2067
- brain, ultrasonics, transmission ultrasound, thermal lesion, 2164
- brain, computer assisted tomography, vertex scan, analysis 2000 examinations, 3838
- computer assisted tomography, face, orbit, paranasal sinus, coronal section, 35 cases, 2729
- computer assisted tomography, face, tomography, 1580
- computer assisted tomography, tuberous sclerosis, 20 children, 3061
- computer assisted tomography, sturge weber syndrome, 1 child, 1 adult, 1573
- implantation, potassium electrode, spreading cortical depression, in vivo measurement, 3721
- model, cupola with a flat base, 428
- skull base**, acoustic nerve neurinoma, chordoma, computer assisted tomography, hypophysis adenoma, 801
- brain infarction, brain tumor, computer assisted tomography, sella turcica, sagittal and coronal scan, 3824
- cervical spine, computer assisted tomography, head, coronal head scan, 1214
- skull base cancer**, computer assisted tomography, face cancer, rhinopharynx cancer, 50 cases, 3442
- skull base tumor**, computer assisted tomography, orbit tumor, whole body scanner indication, 2696
- skull defect**, brain malformation, brain tumor, computer assisted tomography, congenital malformation, histogenesis, organogenesis, computed tomography, indication, 1223
- skull fracture**, brain atrophy, brain hemorrhage, computer assisted tomography, head trauma, hydrocephalus, subdural hematoma, trauma, diagnosis, 1581
- head trauma, injury, mathematic model, model, response probability density function technique, 3365
- sleep**, alertness, computer, electroencephalography, electromyography, rem sleep, telemetry, rat, automatic analysis, 2111
- alpha rhythm, computer, electroencephalography, multichannel recorder, rem sleep, 10 subjects, automation, 2706
- automation, electroencephalography, information processing, eeg data processing chain, 778
- brain depth stimulation, electroencephalography, electrosleep, stimulation, need activation, artificial sleep, 1499
- computer, electroencephalography, rem sleep, spindle, spindle detection, 4 volunteers, 4 patients, phase locked loop, 3424
- computer, electroencephalography, hypnogram, 2707
- electrocorticography, electromyography, rem sleep, stage 3 sleep, rat, sleep stage, automation, 1995
- electroencephalography, electromyography, electrooculography, information processing, multidimensional analysis, 1082

- electroencephalography, electromyography, telemetry, rat, fm-am transmitter, 2110
- electroencephalography, sleep electroencephalography, topology, 5 volunteers, analogue filter analysis, 1494
- electroencephalography, parameter extraction, rem sleep, time series, automatic classification, 1951
- electroencephalography, electrooculography, epilepsy, telemetry, videorecording, automatic analysis, visual analysis, video recording, closed circuit, 1884
- sleep electroencephalography**, automation, computer, computer assisted diagnosis, electroencephalography, sleep waking cycle, review, analysis methods, 1569
 - electroencephalography, sleep, topology, 5 volunteers, analogue filter analysis, 1494
- sleep spindle**, alertness, computer, electroencephalography, electromyography, 5 hydroxytryptophan, levodopa, rem sleep, stage 3 sleep, automatic classification, cat, 1620
- sleep waking cycle**, automation, computer, computer assisted diagnosis, electroencephalography, sleep electroencephalography, review, analysis methods, 1569
- sliding filament theory**, adenosine diphosphate, adenosine triphosphate, model, muscle contraction, quantum theory, transducer, quantum mechanical transducer model, 2033
 - adenosine triphosphate, filament, muscle contraction, myosin, molecular mechanism, 444
 - heart muscle, model, 2054
 - model, muscle contraction, quantum mechanics, quantum mechanical formation, 2419
- slit lamp photography**, cataract, eye photography, tomographic measurements, method, 3343
- slow virus disease**, computer assisted tomography, creutzfeldt jakob disease, encephalopathy, 2 cases, 1603
- smelling**, aversion therapy, behavior disorder, generator, odor, olfactory procedure, new apparatus, 244
 - information processing, nerve cell code, 269
 - phospholipid membrane, frog, 7
- smoke**, dust, environment, electrostatic precipitator, precipitator, review, 3715
- smoke detection**, fet semiconductor, fire alarm, hydrogen detector, 148
- smooth muscle**, artery, blood vessel muscle, brain artery, mathematic model, medial brain artery, orientation, 1080
 - bladder, blood vessel muscle, portal vein, quick load change, rat, rabbit, 2815
 - colon tenia, electricity, hodgkin huxley equation, mathematic model, smooth muscle tone, guinea pig, 2037
 - intestine, intestine motility, transducer, implantation, dog, 3272
 - mathematic model, viscoelasticity, 3150
- smooth muscle contraction**, artery, artery wall, blood vessel resistance, smooth muscle fiber, smooth muscle cell mechanics, 3143
- smooth muscle fiber**, artery, artery wall, blood vessel resistance, smooth muscle contraction, smooth muscle cell mechanics, 3143
- smooth muscle tone**, colon tenia, electricity, hodgkin huxley equation, mathematic model, smooth muscle, guinea pig, 2037
- social worker**, computer, general practice, health center, health visitor, information processing, medical record, nursing, public health service, real time management, great britain, 840
- socket**, knee amputation, leg prosthesis, pneumatic prosthesis, pneumatic suspension, 2642
- sodium**, adenosine triphosphate, calcium, cell membrane, cell membrane permeability, model, transport mechanism, 2011
 - bladder, chloride, freeze drying, potassium, roentgen analysis, skin, soft tissue, frog, toad, 2860
 - blood, electrolyte balance, erythrocyte, magnetic field, plasma, potassium, rat, 1243
 - blood pressure, blood vessel resistance, kidney failure, mathematic model, renovascular hypertension, water, 2420
 - brain, brain cortex, copper, electromagnetic radiation, hypothalamus, iron, magnesium, potassium, zinc, 1600 mhz, rat, 2564
 - cell membrane permeability, chloride, nerve fiber membrane, nerve fiber membrane permeability, nerve fiber membrane steady potential, ph, potassium, crayfish, 1718
 - computer model, digital computer, diuresis, kidney tubule absorption, sodium depletion, water, 478
 - computer model, epidermis, skin permeability, frog, 870
 - computer model, countercurrent multiplier system, kidney tubule absorption, mathematic model, urea, transient simulation, steady state simulation, 473
 - electric model, epithelium, model, sodium pump, 2395
 - excitable membrane, lipid membrane, membrane permeability, nerve fiber membrane, potassium, didactic presentation, 393
 - nerve cell, nerve cell potential, horse leech, 3191
- sodium channel**, calcium channel, heart muscle fiber, procaine, propranolol, verapamil, cat, 2412
 - calcium channel, heart muscle cell membrane, heart muscle cell membrane potential, heart vulnerable period, 2845
 - cell membrane, ion exchange, mathematic model, 2848
 - cell membrane conductance, gating circuit, nerve fiber membrane, potassium channel, transient polarization current, squid, 2070

- electric organ, potassium channel, temperature, electric fish, 76
- gating circuit, nerve fiber membrane potential, gating current blocking, squid, 3550
- hodgkin huxley equation, nerve fiber membrane potential, tetrodotoxin, 931
- learning, mathematic model, memory, nerve cell network, pattern recognition, potassium channel, synapse, 1316
- sodium chloride**, ammonium, membrane potential, voltage clamp, electric resonance, 1720
- sodium cyanide**, carotid artery, clostridiopeptidase a, elasticity, hyaluronidase, iodoacetate sodium, model, noradrenalin, pancreatopeptidase e, maxwell model, voigt model, 1656
- sodium depletion**, computer model, digital computer, diuresis, kidney tubule absorption, sodium, water, 478
- sodium nitroferrocyanide**, computer, malignant hypertension, microprocessor, 3057
- sodium pump**, adenosine triphosphatase, amnesia, cycloheximide, lithium chloride, memory, ouabain, phenytoin, potassium chloride, protein synthesis, 3 phase model, 241
 - electric model, epithelium, model, sodium, 2395
 - nerve fiber membrane potential, nerve fiber potential, tetrodotoxin, myxicola, 1326
- soft contact lens**, electroretinography, dc recording, human, 1522
 - keratopathy, bausch and lomb 't' lens, 132 patients, 263
- soft tissue**, bladder, chloride, freeze drying, potassium, roentgen analysis, skin, sodium, frog, toad, 2860
 - fluoroscopy, trace element, sample mass determination, 2902
 - mathematic model, viscoelasticity, nonlinear system, 3520
- soil**, blood stain, clothing, forensic medicine, isoenzyme, lactate dehydrogenase, weapon, species origin, 3276
 - environment, resistance, soil resistivity measurement, 2890
- soil pollution**, environment, nuclear waste, 2394
- solar cell**, bioelectronics, bioenergy, direct current converter, power supply, telemetry, 3214
 - collimator, environment, solar energy, spectrometry, 2558
 - environment, 2559
 - radiation counting, 2560
- solar energy**, collimator, environment, solar cell, spectrometry, 2558
 - collimator, mirror, 3244
 - environment, power, greenhouse effect, 146
 - environment, photoelectric cell, 3505
- solar radiation**, electromagnetic radiation, radiometry, sunlight, 1814
- soleus muscle**, ankle, anterior tibial muscle, electromyography, foot, gastrocnemius muscle, joint, rotation, sinusoidal torque, human, 895
 - microelectrode, muscle fiber, ph electrode, mouse, 1005
- solution**, boiling point, thermistor, thermometer, boiling point elevation, 2130
- somatomotor epilepsy**, brain depth stimulation, brain edema, electrode, electrode impedance, glucocorticosteroid, mannitol, seizure, visual cortex, cat, 1489
- sound**, auditory stimulation, auditory system, cochlea microphonic potential, electrode, electrophonic effect, 689
 - auscultation, micturition, registration of sound micturition, 1876
 - blood, erythrocyte, mathematic model, erythrocyte shape and propagation, 2821
 - blood, echography, scattering, ultrasonics, 1285
 - computer, hearing, modulation analysis, bird, 3850
 - directional hearing, microphone, microphone array, bone, 3532
 - pattern recognition, optic method, 1684
 - sound pressure, statistics, review, 3527
- sound absorption**, clinical chemistry, spectrometry, 1829
- sound attenuation**, echography, heart muscle, ultrasonics, 2656
- sound burst**, auditory masking, hearing, pattern recognition, 264
- sound detection**, directional hearing, hearing, industrial medicine, 265
- sound filtering**, earmould, hearing aid, model, resonance, side branch, parallel vent, acoustical model, electrical model, 3729
- sound lateralization**, binaural hearing, hearing, dichotic stimulus, 3348
- sound level**, computer program, industrial medicine, noise, cost computation, 2168
 - earmould, hearing aid, real ear canal, 2 cm3 coupler, zwislocki coupler, 3355
- sound level measurement**, auditory stress, ear trauma, environment, hearing, microphone, conga microphone, 1019
 - dosimetry, noise pollution, ear borne dosimeter, 1509
 - echo, environmental pollution, free field measurement, enclosure, 193
 - hearing, speech, running speech, 611
 - industrial medicine, industrial noise, noise pollution, large machine in situ, 3262
 - industrial medicine, industrial noise, noise pollution, in situ measurement, 3261
 - industrial medicine, industrial noise, noise pollution, reflecting plane, 3260
 - industrial medicine, industrial noise, noise pollution, 3259

- industrial medicine, industrial noise, noise pollution, indoors installed machine, 3258
- speech, speech fundamental frequency, effort level, 1029
- sound pressure**, head phone, equivalent levels, 3 types of japanese earphones, 600
 - sound, statistics, review, 3527
- sound velocity**, acoustic impedance, erythrocyte, kidney, liver, muscle, tissue, ultrasonics, viscosity, shear acoustic impedance, 58
- space**, color vision, visual system, human, 266
- space flight**, behavior, communication, cosmonaut, medical assessment, space time dialogue, 295
 - spacelab program, 3011
- spasticity**, anxiety, biofeedback, electromyography, epilepsy, insomnia, paralysis, tension headache, clinical application, review, 1081
 - muscle tone, relative equivalent damping measure, computer analysis, apparatus, 43
- specific heat**, calorimetry, measurement, low temperature calorimeter, 1798
- specimen**, electron microscopy, scanning electron microscopy, surface variation, 1364
- specimen holder**, electron microscopy, scanning electron microscopy, etec corporation, cyclic loading, 3593
- spectacle glasses**, gas mask, refraction, vision, spectacle inserts, 2630
- spectral sensitivity**, mathematic model, visual pigment, techniques, 1097
- spectrin**, erythrocyte, erythrocyte membrane, mathematic model, human, 2423
- spectrometry**, air pollution, microwave radiation, stark spectrometer, 3661
 - air pollution, fourier transform, infrared radiation, 3654
 - air pollution, correlation function, digital computer, 1872
 - air pollution, environment, infrared radiation, light absorption, 2150
 - analog computer, correlation function, 2517
 - automation, electroencephalography, method, 1387
 - brems radiation, megavoltage radiotherapy, half value layer, 5-40 mev, 587
 - chlorophyll, cytochrome, electron transport, infrared radiation, electron tunneling, 180
 - clinical chemistry, digital computer, enzyme kinetics, photometry, zeiss prp, 753
 - clinical chemistry, sound absorption, 1829
 - collimator, environment, solar cell, solar energy, 2558
 - computer, digital computer, fluorimeter, gamma counting, 1404
 - correlation function, electroencephalography, 349
 - cryogenics, neutron radiation, nuclear radiation, 1014
 - cryogenics, electron spin resonance, 3.7 k, 181
 - cryostate, enzyme, photometry, 2506
 - cytology, deoxyribonucleic acid, laser, uterine cervix cytology, 2510
 - decompression, doppler ultrasound flow meter, ultrasonics, decompression data, 1022
 - digital computer, electroencephalography, fourier transform, 3806
 - digital computer, ultraviolet radiation, electron emission, 1559
 - digital computer, nuclear magnetic resonance, process control, 2531
 - display system, electroencephalography, calculated by segments, 348
 - doppler ultrasound flow meter, ultrasonics, spectrum broadening, 2283
 - echo, hearing, intelligibility, signal processing, speech, 2819
 - electroencephalography, evoked response, signal processing, wave, 1740
 - electromagnetic radiation, wave analyzer, 3580
 - electromyography, mathematic model, 1754
 - electron spin resonance, aqueous solution, 581
 - environment, model, noise generator, noise pollution, traffic, 1426
 - fourier transform, liquid crystal, temperature dependence, 1816
 - fourier transform, hadamard transform, comparison, 1399
 - fourier transform, microwave radiation, 3663
 - fourier transform, infrared radiation, chemistry, 3656
 - fourier transform, infrared radiation, polymer analysis, 3655
 - fourier transform, image processing, phase spectrum, walsh transform, 1530
 - frequency analysis, 1647
 - frequency meter, speech, voice, fundamental frequency, 612
 - frequency modulation, laser, molecular structure, derivative spectroscopy, 2146
 - hearing, speech intelligibility, vocal cord, vowel, voice onset, fundamental frequency, vowel consonant, 259
 - hearing, loudness discrimination, parameter extraction, model, 910
 - image intensifier, 2149
 - image processing, infrared radiation, image dissection, 579
 - image processing, motion blur, 134
 - image processing, ion scattering, 2872
 - infrared radiation, laser, light modulator, telemetry, monochromate, carbon dioxide laser, 2900
 - laser, submillimeter table, 574

- light, ultraviolet radiation, fourier transform, 3644
- light modulator, high speed chopper wheel, air turbine, 179
- microscopy, positioning device, television camera, ccd, 2541
- molecular structure, photometry, oscillator strength, double beam monochromator, 170
- nuclear magnetic resonance, receiver, blocking effect, 1416
- photoelectric cell, photocathode, photo multiplier, 105
- pitch, speech, 909
- roentgen radiation, 5-200 kev, 588
- speech, monkey, 260
- speech, distance relation, 905
- speech, 100 cases, 2946
- speech, voice, voiced voiceless distinction, 1062
- ultrasonics, 196
- multichannel operation, fabry perot meter, 1345
- spectrophotometry**, arteriovenous oxygen difference, hemoglobin, oxygen blood level, flowing whole blood esophagus, 1002
- bone cement, gas chromatography, methacrylic acid, residue determination, 1623
- spectroscopy**, evoked acoustic nerve response, pitch, frequency following response, harmonics, 2979
- speech**, ad converter, 651
- air flow, mouth, pneumotachygraphy, measurement of airflow, 654
- algorithm, electromyography, lip, analysis, synthesis, manipulation, feature, 1985
- algorithm, pitch, evaluation, 906
- auditory discrimination, hearing, loudness, loudness discrimination, vowel consonant, 703
- auditory rehabilitation, hearing aid, processing of signals, 2977
- auditory rehabilitation, hearing aid, australia, 1520
- averaging, 1687
- binaural hearing, hearing, intelligibility, interfering speech, human, 55
- computer interface, computer program, digital computer, man machine interaction, duvo, 3088
- computer interface, digital computer, speech pitch measurement, 64
- computer model, speech synthesizer, markov model, 2447
- consonant, time, 547
- consonant, hearing, speech intelligibility, stop consonant, 453
- consonant, intelligibility, spanish, english, voice onset time, 2583
- consonant, voice onset time, 2582
- consonant, nasal speech, linear predictive code, 902
- consonant, fricative consonants, japan, 2495
- correlation function, electromyography, larynx, volunteer, 3217
- correlation function, vocal pitch, autocorrelation, 901
- deafness, touch, 2629
- deafness, hearing, touch, 3352
- deafness, hearing, hearing aid, speech coding, 1513
- deafness, hearing, dichotomic hearing, speech compression, 2817
- digital computer, information processing, pattern recognition, speech frequency, 63
- digital computer, signal handling, 1866
- digital computer, speech intelligibility, speech understanding system, 3230
- echo, hearing, intelligibility, signal processing, spectrometry, 2819
- echography, vowel, vowel tenseness, 2908
- echography, electromyography, ultrasonic transducer, new transducer, 3236
- formant, voice spectrography, vowel, 3216
- frequency meter, spectrometry, voice, fundamental frequency, 612
- hearing, sound level measurement, running speech, 611
- hearing, speech intelligibility, onset discrimination, 456
- hearing, intelligibility, child, 455
- hearing, pitch, speech synthesizer, speech evaluation, 2042
- hearing, nonsense syllable mimicry, 3351
- hearing, speech intelligibility, vowel, l,r context, 54
- hearing, intelligibility, signal noise ratio, amplitude compression, 65
- hearing, intelligibility, acoustic cues, 1512
- hearing impairment, perception deafness, signal noise ratio, speech intelligibility, 1288
- intelligibility, signal noise ratio, speech enhancement, 3533
- intelligibility, 2446
- joint, movement, vocal system, 1867
- lip, mouth movement, lip opening, 1682
- lock in amplifier, cat, 615

- mathematic model, vocal system, inverse filtering, 614
- mathematic model, 1685
- mathematic model, vocal cord, man, 41
- medical record, radiology, retrieval system, patient name, 3012
- pattern recognition, regression, speaker independent recognition, 2869
- pitch, spectrometry, 909
- pitch, maximum likelihood, 907
- sound level measurement, speech fundamental frequency, effort level, 1029
- spectrometry, monkey, 260
- spectrometry, distance relation, 905
- spectrometry, 100 cases, 2946
- spectrometry, voice, voiced voiceless distinction, 1062
- speech discrimination, utterance classification, 908
- speech discrimination, speech synthesis, 904
- velopharyngeal closure, vowel, photoelectric instrument, velograph, 2947
- vocal pitch, 2581
- vocal system, vowel, tract length control, 2440
- vocal system, glottal wave, 2584
- vowel, child, 2585
- 2613
- whale, 2994
- grammatical coding, 658
- vocoder, 2114
- silence detector, 1688
- homomorphic prediction, convolution method, linear predictive code, 903
- optimal quantization, 211
- key words, 2219
- speech audiometry**, audiometry, calculation of hearing loss, 696
- speech discrimination**, deafness, hearing aid, intelligibility, noise, signal noise ratio, 34 patients, peak clipping, automatic pain control, 2628
 - hearing aid, perception deafness, radio frequency clipping, taped speech, 2239
 - speech, utterance classification, 908
 - speech, speech synthesis, 904
- speech intelligibility**, auditory recruitment, hearing aid, occupational deafness, protective hearing aid, 1102
 - computer program, hearing, vowel, speech synthesis, 1030
 - consonant, hearing, speech, stop consonant, 453
 - digital computer, speech, speech understanding system, 3230
 - echo, hearing, hearing impairment, delayed speech, 2996
 - hearing, spectrometry, vocal cord, vowel, voice onset, fundamental frequency, vowel consonant, 259
 - hearing, speech, onset discrimination, 456
 - hearing, speech, vowel, l,r context, 54
 - hearing aid, telephone telemetry, 203 subjects, auxiliary equipment, 3219
 - hearing aid, hearing impairment, binaural, test procedure, 2978
 - hearing impairment, perception deafness, signal noise ratio, speech, 1288
 - signal noise ratio, linear prediction, speech synthesis, 1442
- speech spectrography**, forensic science, frequency analysis, larynx prosthesis, sex identification, vocal system, 12 volunteers, experimental study, 3107
- speech synthesizer**, computer interface, digital computer, medical record, telephone enquiry, 3086
 - computer model, speech, markov model, 2447
 - consonant, hearing, information science, intelligibility, vowel, phoneme boundary effect, voice onset time, 57
 - electric filter, discrete time filter, 232
 - hearing, pitch, speech, speech evaluation, 2042
- speech training**, audiology, portable equipment, children, 1507
- spermatozoon**, counter, light scattering, spermatozoon motility, 1368
 - spermatozoon motility, light scattering, swimming speed determination, bull, 3316
- spermatozoon motility**, computer, evaluation, 1157
 - counter, light scattering, spermatozoon, 1368
 - spermatozoon, light scattering, swimming speed determination, bull, 3316
- sphenoid electrode**, convulsion, electroencephalography, long term monitoring, 100 cases, apparatus, 668
- sphygmomanometry**, blood pressure, exercise, monitoring, semiautomatic monitoring, electronic sphygmomanometer, 2186
- spider nevus**, argon laser, hemangioma, 17 lesions in 16 patients, 2897
- spike**, automation, electroencephalography, epileptic focus, autoregressive filter model, 4 patients, spike and wave, 1946

- computer, electromyography, motor unit, muscle disease, neuropathy, computer analysis, 26 subjects, 75 muscles, human, 1953
- computer program, digital computer, information processing, lateral geniculate body, minicomputer, probability, statistics, cat, 1617
- counter, nerve cell potential, event counter, 1355
- display system, electromyography, extraocular muscle, muscle disease, neuropathy, visual display, 704
- electroencephalography, filter, detection, 2548
- electromyography, frequency analysis, motor unit potential, firing time statistics, spectral analysis, 2077
- electromyography, minicomputer, muscle isometric contraction, 1954
- excitatory postsynaptic potential, mathematic model, nerve cell potential, interspike time distribution, 2849
- lateral geniculate body, mathematic model, nerve cell potential, red nucleus, reticular formation, markov model, ventrobasal complex, 1313
- mathematic model, vestibulocochlear organ, pigeon, 3198
- mathematic model, nerve cell network, rhythmic activity, snail, 1728
- mathematic model, nerve cell potential, statistics, 3557
- mathematic model, membrane potential, nonlinear system, finite cable model, cable model, 1312
- nerve cell potential, nervous system, pulse height analysis, delay line, analog delay, 1492
- nerve conduction, nerve fiber, ranvier node, theory, method, 2072
- spike wave**, computer, electrocardiography, petit mal, prolonged recording, on line, 5 cases, 2325
- spina bifida**, computer assisted tomography, spinal cord disease, spinal cord tumor, spine disease, 12 cases, 808
- spinal cord**, arteriovenous malformation, computer assisted tomography, 4 cases, 834
 - axoplasm flow, computer, mitochondria, tissue culture, mouse, 2372
 - cerebellum, computer assisted tomography, hemangioblastoma, von hippel lindau disease, case report, 3073
- spinal cord disease**, computer assisted tomography, spina bifida, spinal cord tumor, spine disease, 12 cases, 808
 - computer assisted tomography, metrizamide, syringomyelia, tumor, vertebral canal stenosis, 3 cases, 2357
- spinal cord injury**, bladder, bladder pacemaker, electrode, implant, micturition, paraplegia, quadriplegia, urethra, baboon, 1486
 - gait, leg brace, oxygen consumption, rehabilitation, spinal cord transverse lesion, walking, 3 cases, pneumatic orthosis, 289
- spinal cord lesion**, brain lesion, computer assisted tomography, neurinoma, syringomyelia, diagnosis, 1190
- spinal cord motoneuron**, microelectrode, voltage clamping, current clamping, circuit development, cat, 2546
- spinal cord posterior horn**, computer, dorsal root potential, microelectrode, nerve cell potential, substantia gelatinosa, very small neuron, activity isolation method, mouse, 1238
- spinal cord transverse lesion**, gait, leg brace, oxygen consumption, rehabilitation, spinal cord injury, walking, 3 cases, pneumatic orthosis, 289
- spinal cord tumor**, computer assisted tomography, spina bifida, spinal cord disease, spine disease, 12 cases, 808
- spindle**, computer, electroencephalography, rem sleep, sleep, spindle detection, 4 volunteers, 4 patients, phase locked loop, 3424
- spine**, biomechanics, 273
 - biomechanics, intervertebral disk, mathematic model, workload, systems identification scheme, linear viscoelastic properties, 3140
 - ergonomics, model, human spine, torso, head, three-dimensional model, 2425
 - lumbar spine, mathematic model, spine loading, displacement curve, preload, 885
 - lumbar spine, mathematic model, muscle, muscle force, 7 muscle shapes, 430
 - lumbar spine, mathematic model, 3129
 - monitoring, stress, telemetry, radioendosonde, 2105
 - spine traction, turnover frame, automotor frame, 35 cases, 1106
- spine disease**, computer assisted tomography, spina bifida, spinal cord disease, spinal cord tumor, 12 cases, 808
- spine traction**, spine, turnover frame, automotor frame, 35 cases, 1106
- spinocerebellar degeneration**, computer assisted tomography, hereditary cerebellar ataxia, woman of 61, 3066
- spirometry**, atelectasis, open heart surgery, postoperative care, incentive spirometer, bartlett edwards spirometer, prevention, 1868
 - digital computer, gas exchange, information processing, 2756
 - forced expiration, forced expiratory volume, 2 electronic devices comparison, 1870
 - minicomputer, pneumography, impedance pneumograph, microprocessor, 1616
 - jones spirometer, stead wells spirometer, comparison, 3713
- splanchnic nerve**, evoked cortical response, orbital cortex, tibial nerve, vagus nerve, nerve stimulation, cat, 2973

spleen, computer assisted tomography, echography, kidney, pancreas, differential diagnosis, case report, 3817
 - echography, ultrasonics, 2673

spleen cell transplantation, cellular immunity, corona virus, immune deficiency, mononuclear granulocyte, mouse hepatitis virus, thymectomy, T lymphocyte, virus infection, 3402

splint, leg, orthosis, weight bearing, 1320 mechanics, 3001
 - leg, orthosis, total hip prosthesis, case report, 3000

sport, athlete, motivation, personality, psychology, rating scale, coaching, 3474
 - computer, performance, quality control, training, decathlon, model analysis, computer generated scoring tables, 3475

spreading cortical depression, brain cortex steady potential, electrode, mercurous chloride, rat, 2230
 - implantation, potassium electrode, skull, in vivo measurement, 3721

square wave generator, frequency multiplier, 520

square wave stimulator, model, skin conductance, stimulation, transcutaneous stimulation, 2549

stabilography, anesthetic recovery, outpatient, measurement, 3394
 - body posture, computer, eye movement, visual stimulation, 275

stage 3 sleep, alertness, computer, electroencephalography, electromyography, 5 hydroxytryptophan, levodopa, rem sleep, sleep spindle, automatic classification, cat, 1620
 - electrocorticography, electromyography, rem sleep, sleep, rat, sleep stage, automation, 1995

staining, acantholysis, chickenpox, herpes zoster, immunosuppression, vesiculo bullous disorders, paragon multiple stain, 500

stainless steel, cardiocography, electrode, fetus, fetus monitoring, scalp, fine stainless steel wire, 100 cases, 3395
 - hemodialysis, ultrafiltration, microcapillary system, 1485
 - poly(methacrylic acid methyl ester), prosthesis, prosthetic stem design, 2761
 - poly(methacrylic acid methyl ester), tensile strength, wire fixation, 1526

standing, handicapped child, meningomyelocele, mobility, orthotics, 3002

stannic oxide, laser, photometry, photoresistor, semiconductor, 3645

stapes, age, bekesy audiometry, bone conduction, automatic audiometry, grason stadler bekesy audiometer, 3480

stapes reflex, acoustic impedance, brain stem, neurootology, pons angle tumor, diagnostic value, 1683
 - hearing aid, 272
 - tympanometry, instrument, electrical stimulation, 1504

staphylococcus aureus, cell aggregation, glanzmann disease, thrombocyte aggregation, willebrand disease, measurement device, 3283
 - contamination, laminar air flow, mouse, staphylococcus epidermidis, streptococcus, defined flora, husbandry, 3205

staphylococcus epidermidis, contamination, laminar air flow, mouse, staphylococcus aureus, streptococcus, defined flora, husbandry, 3205

starling law, artificial heart, assisted circulation, heart left ventricle, automatic driving system, 2189

static electricity, electrocardiography, electrode, electromyography, disturbance by exogenous static electricity, 1000

static perimetry, electrooculography, visual field, automatic perimetry, 1566

statistics, acceleration, computer program, eye, information processing, vestibular nystagmus, velocity, analog processing, cross correlation data analysis, 1497
 - background radiation, decision, dosimetry, model, radioactivity, statistical interpretation of counting data, 306
 - behavior, decision, mathematic model, motivation, nerve cell network, stimulus, behavioral mode selection, 399
 - blood disease, cell membrane, erythrocyte membrane, erythrocyte osmotic fragility, osmotic fragility curve, 2180
 - blood pressure, heart left ventricle, heart ventricle pressure, mathematic model, ape, self modelling, 1712
 - camera, mathematic model, modulation transfer function, scintigraphy, scintillation, 1921
 - cancer, population model, sampling, survival, truncated data, censored sample, 2403
 - cancer, cancer chemotherapy, diagnosis, mathematic model, radiotherapy, therapy evaluation, 2361
 - cancer growth, computer program, information processing, mathematic model, gompertz function, fortran, 2782
 - computer, constant function curve, 538
 - computer, medical record, obstetrics, perinatology, 370
 - computer, computer program, emergency ward, information processing, model, deterministic simulation model, data reconstruction, 2686
 - computer assisted tomography, gamma counting, noise, general expression, 1176
 - computer model, covariance, ratio use, 3122
 - computer program, parameter extraction, 688
 - computer program, information processing, probability, decomposition, algol, gaussian curve, 2404

- computer program, correlation function, usa, 1638
- computer program, motorized transport, stochastic model, traffic, vehicle degradation, safety inspection, 1630
- computer program, digital computer, information processing, lateral geniculate body, minicomputer, probability, spike, cat, 1617
- correlation function, drug dependence, family psychiatry, heroin, 3494
- correlation function, kendall rank test, 2021
- cost, decision, diagnosis, differential diagnosis, ischemic heart disease, mathematic model, mathematics, prognosis, expected outcome loss, 759
- cost, epidemiology, immunization, mathematic model, model, 3509
- data reduction, information processing, 2022
- decision, pattern recognition, reading aid, character recognition, 531
- decision theory, signal detection, 3119
- diagnosis, sampling, expert estimate, 24
- digital filtering, signal processing, 3574
- electrocardiography, heart arrhythmia, 1863
- electroencephalography, evoked response, filter evaluation, 1083
- epidemiology, model, mortality, population model, competition, prey predator, 2785
- feedback system, least square method, parameter estimation, 1259
- gene frequency, inheritance, migration, mutation, population model, stochastic model, island model, 2788
- glomerulopathy, histopathology, information processing, cluster analysis, 2959
- image production, model, radiography, unified view of imaging system, 1923
- information processing, regression, least square method, 2400
- information processing, mathematic model, nerve cell membrane potential, nerve cell network, nonlinear system, 2069
- lifespan, population model, lifetime distribution, 2407
- mathematic model, nerve cell potential, spike, 3557
- mathematics, model, population dynamics, whale, 9
- model, variance analysis, 2775
- multivariate analysis, chi test, 17
- pattern recognition, 32
- pharmacotherapy, public health service, 416
- physiology, ranking test, 2013
- pneumoconiosis, logistic model, ordered categorical data, binary comparisons, paired data, 2387
- probability, markov chain, 22
- scintigraphy, photon counter, zero crossing distribution, 1397
- sound, sound pressure, review, 3527
- bibliography, fuzzy sets, 2783
- species comparison, similarity index, 2018
- steady potential**, computer model, digital computer, electric field, 82
- steam sterilization**, integrator, monitoring, temperature, 199
- stenosis**, artery murmur, blood flow, model, phonocardiography, 1709
- step test**, bicycle ergometry, calculation, heart function test, oxygen consumption, cylinder, 646
- stereophotogrammetry**, eye fundus, eye photography, fluorescein retina angiography, new device, 3587
- stereophotography**, comparator, glaucoma, optic disk, new device, 3733
 - eye, glaucoma, optic disk cup, fundus, 126
- stereoradiography**, computer assisted tomography, 3 dimensional information display, 807
- stereoscopic vision**, digital computer, image processing, photometry, vision, 3647
 - eye surgery, illumination, microscopy, new instrument, 3038
 - nerve cell network, neuronal model, 3536
 - photography, vision, angle detection, 2438
- stereotaxic atlas**, prefrontal cortex, cat, 1078
- stereotaxic device**, brain, head holder, stereotaxic implantation, mouse, 2622
- stereotaxic implantation**, behavior, brain depth recording, brain depth stimulation, stimulator, iguana, 243
 - brain, head holder, stereotaxic device, mouse, 2622
 - brain depth recording, cerebellum, microelectrode, awake, cat, 1075
 - stereotaxic surgery, horizontal zero plane, rabbit, 2232
- stereotaxic surgery**, arteriovenous fistula, artery clamp, brain artery, clipping device, 1554
 - brain, cannula, pneumoencephalography, substantia nigra, monkey, 2971
 - brain hematoma, computer assisted tomography, case report, screw action technique, 3453
 - brain tumor, computer assisted tomography, 52 cases, 3078
 - computer, data base, thalamus, automatic thalamus mapping, 130 cases, 856
 - dura mater, mathematical model, method, 672
 - electrode, glass electrode, microelectrode, filling procedure, 1888

- stereotaxic implantation, horizontal zero plane, rabbit, 2232
- stereotaxis**, antenna, brain depth stimulation, chemotherapy, microwave radiation, radiation hazard, 2172
- sterility**, eye surgery, microscopy, microsurgery, 2098
- sterilization**, forceps, laparoscopy, manipulator, uterus, bipolar principle, 660
 - laparoscopy, instrumentation, bipolar electrode, 661
- sternum**, angiocardiology, heart surgery, sternum retractor with radiolucent blades, 1145
- stethoscope**, auscultation, education, group teaching, wireless stethoscope type headphone, 3702
 - brain angiography, brain artery aneurysm, brain vasospasm, cerebrovascular disease, computer, electronic stethoscope, 6 illustrative cases, 2162
 - disaster, monitoring, trauma, war, 1141
 - doppler ultrasound flow meter, fetus, fetus heart rate, fetus viability, monkey, 1040
 - doppler ultrasound flow meter, varicocele, doppler stethoscope, value, 1449
- stiffness**, compact bone, fatigue, stress fracture, scanning electron microscopy, cattle, 1903
 - knee, non linear coupled stiffness, measurement, human, 40
 - radiation dose fractionation, roentgen radiation, skin, skinfold, rupture, split dose, effects, rats, 1272
- stimulation**, artificial heart pacemaker, electrode, skin electrode, thorax wall, external pacemaker, stimulation through subcutaneous pin electrodes, 2192
 - behavior, vibration, pocket sized cueing device, 245
 - brain depth stimulation, electroencephalography, electrosleep, sleep, need activation, artificial sleep, 1499
 - model, skin conductance, square wave stimulator, transcutaneous stimulation, 2549
- stimulation artifact**, artifact reduction, microiontophoresis, nerve cell potential, raphe nucleus, technique, 1806
- stimulation threshold**, artificial heart pacemaker, electrode, heart stimulation, comparative study, thresholds in leads of different size, 640
 - brain depth stimulation, electroencephalography electrode, striate cortex, visual cortex, visual prosthesis, macaque monkey, 1072
 - electrocardiography, endocardium, heart stimulation, amplitude unipolar endocardial electrogram, 2595
- stimulator**, behavior, brain depth recording, brain depth stimulation, stereotaxic implantation, iguana, 243
 - cell membrane potential, heart muscle, light reflection, pulse generator, capacitor discharge, frog, 78
- stimulus**, behavior, decision, mathematic model, motivation, nerve cell network, statistics, behavioral mode selection, 399
 - computer, nerve cell, threshold, 2757
- stochastic model**, age, breast cancer, cancer incidence, cancerogenesis, epidemiology, menarche, menopause, 2768
 - compartment model, mathematic model, 2392
 - computer assisted tomography, gamma radiation, scintigraphy, 1016
 - computer program, motorized transport, statistics, traffic, vehicle degradation, safety inspection, 1630
 - ectopic beat, electrocardiography, extrasystole, mathematic model, poisson process, 21 patients, 2196
 - epidemic, inactivated virus vaccine, influenza a, influenza virus a, mathematic model, vaccination, 3499
 - excitatory postsynaptic potential, inhibitory postsynaptic potential, mathematic model, nerve cell, automation model, 2466
 - gene frequency, inheritance, migration, mutation, population model, statistics, island model, 2788
 - information processing, nerve cell, nerve cell network, 3561
 - nerve cell potential, ten hoopen reuver model, 1318
- stomach**, endoscopy, esophagus foreign body, fiberoscope, foreign body extraction, gastrointestinal tract, special snare, coins, children, adults, 1034
 - esophagus, foreign body, magnet, nasogastric tube, magnetic removal, 613
- stomach acid**, esophagus ph, gastroesophageal reflux, ph electrode, automatic analysis, 1836
- stomach cancer**, computer assisted diagnosis, data base, dyspepsia, 762
- stomach disease**, computer assisted tomography, short survey, diagnosis, 3451
- stomach emptying**, mathematic model, 475
- stomach ulcer**, argon laser, gastrointestinal hemorrhage, gastroscopy, laser, dogs, device, treatment, 3274
 - computer, electrocoagulation, electrode, gastrointestinal hemorrhage, gastroscopy, dogs, computer controlled electro coagulation, 3058
- stone basket**, ureter stone, 40-60 h2, vibrating basket, dogs and patients, 1068
- stop flow technique**, automation, cholinesterase, enzyme inhibition, information processing, inhibition constant, 1151
- storage oscilloscope**, computer, digital analog converter, signal averager, data acquisition, 1786
- strabismus**, amblyopia, computer, eye movement, binocular vision, motility testing, 3485
- strain gauge transducer**, air flow, air velocity, manometry, bell manometer, 152
 - amplifier, manometry, pressure transducer, 1376
 - ectopic beat, heart infarction, heart muscle contraction, inotropism, miniature segment length strain gauge, 2924
 - force transducer, gastrointestinal tract, silicone, contraction, implantation, water proof, 2918
 - directionally insensitive, 3627

- strength duration curve**, ankle, biomechanics, muscle strength, tibialis anterior muscle, model, dog, 287
 - brain depth stimulation, lateral hypothalamus, medial forebrain bundle, nerve cell potential, rat, 3182
 - defibrillation, transchest defibrillation, trapezoidal waveform, ponies, dog, 3697
- streptococcus**, contamination, laminar air flow, mouse, staphylococcus aureus, staphylococcus epidermidis, defined flora, husbandry, 3205
- stress**, acceleration, cardiovascular system, headache, heart rate, mathematic model, 2812
 - acrylic acid, femur, prosthesis, total hip prosthesis, charnley prosthesis, 2261
 - anesthetist, heart rate, hospital personnel, mental load, operating room, telemetry, 525
 - aorta valve, heart valve leaflet, geometrical data, human valve, 1268
 - biomechanics, bone strength, femur, three dimensional analysis, human, 2028
 - bone, bone strength, fatigue, model, bone bending fatigue strength, human, 3139
 - car driving, fatigue, model, real situation simulation, highway driving, 3370
 - electric shock, restraining device, tail, system, free moving rat, 2965
 - mathematic model, vibration, visual tracking, whole body vibration, conceptual stress study model, 3141
 - monitoring, spine, telemetry, radioendosonde, 2105
- stress fracture**, acrylic acid, bone cement, fracture, fracture characteristics, 1624
 - compact bone, fatigue, stiffness, scanning electron microscopy, cattle, 1903
- stress incontinence**, bladder sphincter, electrostimulation, urethra pressure, urine incontinence, 40 patients, 664
- stretcher**, eye surgery, sclera buckling procedure, silicone, sponge implant, new device, 3397
- striate cortex**, brain depth stimulation, electroencephalography electrode, stimulation threshold, visual cortex, visual prosthesis, macaque monkey, 1072
- strip chart recorder**, computer memory, digital computer, digital recording, information processing, address indicator, 991
- stroboscopy**, cytophotometry, retina, retina bipolar ganglion cell, ribonucleic acid, target movement, histochemistry, frog, 2632
 - electroglottography, vibration, vocal cord movement, 20 normal persons, 3242
 - evoked cortical response, evoked visual response, ophthalmoscopy, retina macula degeneration, retina pigment degeneration, retina macula scar, stimulator ophthalmoscope, 47 patients, 2620
 - lens, television, vocal cord, amplitude determination, 3309
- stroke**, aged, brain hematoma, brain infarction, brain tumor, cerebrovascular accident, computer assisted tomography, subdural hematoma, diagnostic value, 3830
 - aphasia, brain infarction, computer assisted tomography, embolism, medial brain artery, 60 cases, 1195
 - brain angiography, brain scintigraphy, cerebrovascular accident, computer assisted tomography, review, 1587
 - brain atherosclerosis, carotid endarterectomy, doppler ultrasound flow meter, diagnosis, 2962
 - brain hemorrhage, brain tumor, brain ventricle, computer assisted tomography, 3454
 - computer, heart infarction, prognosis, interactive computer program, 3042
 - computer assisted tomography, electroencephalography, evoked somatosensory response, human, 2335
- strontium 89**, cesium 137, diffusion, epidermis, skin permeability, role, 292
- strontium 90**, body burden, radioactive contamination, radium 226, retention, excretion, 2 cases, 10 yr follow up, 94
 - bone, fallout, yugoslavia, 1339
- structure activity relation**, computer, drug analysis, mass spectrometry, pattern recognition, pharmacology, 3092
- st segment**, body posture, electrocardiography, heart infarction, heart rate, thorax electric field, 35 precordial leads, method, 1049
 - electrocardiography, frequency analysis, recording, high side frequency filtration, 639
 - electrocardiography, ink writing, recording, st distortion, direct writing recorders, 1051
- sturge weber syndrome**, computer assisted tomography, skull, 1 child, 1 adult, 1573
- subarachnoid cyst**, computer assisted tomography, craniopharyngioma, exophthalmos, hemianopia, orbit, boy of 7, 2738
- subarachnoid hemorrhage**, arachnoiditis, brain artery aneurysm, brain hemorrhage, computer assisted tomography, 8 cases, 1578
 - arteriovenous malformation, cerebellum tentorium, computer assisted tomography, vein sinus, vein thrombosis, normal ct appearance, nonneoplastic pathology, 1596
 - brain, brain hemorrhage, electricity, electric trauma, hydrocephalus, pneumoencephalography, cat, dog, man of 25, 239
 - brain artery aneurysm, computer assisted tomography, 46 cases, 1579
 - cerebrospinal fluid, computer assisted tomography, hydrocephalus, normotensive hydrocephalus, penthanil yb 169, scintiscisternography, 54 cases, 2721
 - computer assisted tomography, head trauma, 109 children, 3758
- subdural empyema**, brain abscess, computer assisted tomography, empyema, epidural space, 15 patients, 3438
 - brain angiography, brain falx, computer assisted tomography, epidural abscess, otitis media, 11 yr old girl, neurosurgery, interhemispheric localization, 3062

subdural hematoma, aged, brain hematoma, brain infarction, brain tumor, cerebrovascular accident, computer assisted tomography, stroke, diagnostic value, 3830

- brain abscess, brain scintigraphy, brain tumor, computer assisted tomography, meningioma, posterior fossa, review, 1194
- brain atrophy, brain hemorrhage, computer assisted tomography, head trauma, hydrocephalus, skull fracture, trauma, diagnosis, 1581
- brain blood flow, brain infarction, brain scintigraphy, brain tumor, camera, hydrocephalus, scintillation camera, method, diagnosis, 190
- brain hemorrhage, computer assisted tomography, epidural hemorrhage, attenuation value, 14 cases, 800
- computer assisted tomography, xenon 133, contrast enhancement, case report, man of 54, 3052
- computer assisted tomography, epidural hematoma, 30 patients, 3434

subdural hygroma, computer assisted tomography, hematoma, hydrocephalus, postoperative evaluation, 3813

subluxation, arthroplasty, joint total replacement, knee, 1 yr follow up, 47 out of 53 cases, wide track polycentric knee prosthesis, 2645

submaxillary gland, electrode, silver, silver chloride, voltage clamp, rabbit, 3233

substantia gelatinosa, computer, dorsal root potential, microelectrode, nerve cell potential, spinal cord posterior horn, very small neuron, activity isolation method, mouse, 1238

substantia nigra, brain, cannula, pneumoencephalography, stereotaxic surgery, monkey, 2971

substrate, kidney, liver, mathematic model, time dependence, 3165

subtraction method, brain infarction, brain tumor, computer assisted tomography, contrast intensification, 19 cases, 2733

sucrose c 14, calcium 45, heart muscle, diffusion in transient and steady state, kittens, 2005

suction cup, intraocular pressure, continuous pressure measurement, rabbit, 2241

suction drainage, 3035

sudden deafness, audiometry, auditory masking, cochleography, evoked acoustic nerve response, meniere disease, tuning curve, 2443

suicide attempt, computer, attemptor identification, 1149

sulfur, infrared radiation, light reflection, photometry, reflection standard, 3490

sulfur dioxide, air pollution, conductivity, hydrogen peroxide, temperature correction, 3680

- air pollution, atmosphere, environment, microwave radiation, 1873
- air pollution, carbon monoxide, hydrochloric acid, hydrofluoric acid, infrared radiation, nitrogen oxide, 233

sulfur hexafluoride, carbon monoxide, helium, lung diffusion, 3163

sun, energy resource, environmental health, power consumption, power generation, 1437

sunlight, electromagnetic radiation, radiometry, solar radiation, 1814

supercoiling, deoxyribonucleic acid, elastic model, 874

superior mesenteric angiography, angiography, brain angiography, computer assisted tomography, method, case series, 1205

superior ophthalmic vein, computer assisted tomography, orbit, high resolution tomography, 200 cases, 1606

superoxide dismutase, catalase, escherichia coli, respiration, ultraviolet radiation, continuous flow system, 1344

supination, biomechanics, elbow, joint mobility, pronation, 100 volunteers, 1658

support, embolism prevention, heel, postoperative complication, thrombosis prevention, heel support device, 2925

surface, blood clotting, thrombocyte, blood surface interaction, hydrogel interfaces, 1037

surface water, computer, drinking water, mass spectrometry, organic compound, water pollution, united states, trace analysis, 3796

surgery, anesthesia, monitoring, nitrous oxide, oxygen consumption, oxygen measurement, 1934

- artery pulse, computer, electrocardiography, heart left ventricle ejection time, heart sound, heart systolic time interval, pdp 11, real time, 851
- computer, medical record, machine output, rationalization, 1224
- disposable, economy, hospital running cost, disposable products in surgery, usa, 198
- electroencephalography, monitoring, signal processing, 1140
- incision, skin elasticity, excision, 1555

surgical microscope, experimental animal, microphotography, microsurgery, vascular surgery, 2 separately operated microscopes, foot pedal operated zoom, human surgery, adaptation possible, 327

- eye surgery, stable base, 1895
- eye surgery, eyepiece heaters, 752

survival, breast carcinoma, cancer, mathematic model, 1642

- cancer, population model, sampling, statistics, truncated data, censored sample, 2403

survival rate, computer program, follow up, life table, population model, risk factor, 1637

suspension, elasticity, flow, lecithin, mathematic model, shear rate, viscosity, 1710

- sample holder, viscometry, 553

sustained release preparation, collagen, young modulus, 1665

sweat gland, cell membrane potential, glass electrode, kidney slice, microelectrode, self filling, semifloating, rat,

- thermodynamics, thermoregulation, heat pipe theory, 209
- sweating**, artifact, electrocardiography, electroencephalography, model, skin abrasion, skin dystrophy, skin injury, skin potential, transcutaneous stimulation, wound healing, 3234
- biofeedback, circadian rhythm, heart, mathematic model, 2791
- sweep generator**, electrostimulator, transient response, frequency response, sine wave stimulator, 2976
- oscilloscope, recording, logarithmic time base, 2866
- swimming**, circadian rhythm, mathematics, nerve cell network, differential equation, fish, 3553
- swimming device**, blood oxygen tension, countercurrent multiplier system, gas, mathematic model, oxygen electrode, experimental model verification, eel, 914
- computer model, countercurrent multiplier system, gas exchange, mathematic model, 913
- switch**, active filter, 513
- light modulator, waveguide, 3243
- high voltage switch, 506
- sympathectomy**, blood vessel resistance, muscle blood flow, papaverine, vasodilatation, rate sensitivity regulation, cat, 645
- sympathetic nerve**, brain ischemia, skin temperature, thermography, new apparatus, 2563
- synapse**, granular cell, hippocampus, information science, mathematic model, nerve cell, information theory, 2081
- hodgkin huxley equation, nerve fiber, nerve fiber membrane potential, white noise, squid, 933
- illumination, mathematic model, retina horizontal nerve cell, uniform illumination, 493
- information processing, mathematic model, 77
- learning, mathematic model, memory, nerve cell network, pattern recognition, potassium channel, sodium channel, 1316
- mathematic model, memory, nerve cell potential, memory-storage capacity, 3181
- synapse transmission**, mathematic model, memory, neurotransmitter, non linear model, 2235
- model, nerve cell, photoreceptor, postsynaptic receptor, presynaptic receptor, retina, 2844
- synapse vesicle**, brain homogenate, decanting device, 1885
- synaptosome membrane**, chlorpromazine, tetracaine, structural rearrangements, rat, guinea pig, 390
- synchrotron**, ionization meter, photometry, ultraviolet radiation, ionization chamber, 1009
- syncytium**, anisotropy, heart muscle membrane potential, mathematic model, membrane potential, muscle, nerve, dog, 3184
- synovial fluid**, age, arthritis, arthrosis, rheology, sex, human, 3519
- hip, lubricating agent, lubrication, prosthesis, total hip prosthesis, 3145
- syringe**, acid base balance, blood gas, blood sampling, b109 syringe, 2920
- blood carbon dioxide tension, blood oxygen tension, blood ph, blood sampling, blood storage, b109 sampler, 622
- syringomyelia**, arnold chiari malformation, computer assisted tomography, metrizamide, myelography, 20 cases, 3765
- brain lesion, computer assisted tomography, neurinoma, spinal cord lesion, diagnosis, 1190
- computer assisted tomography, metrizamide, spinal cord disease, tumor, vertebral canal stenosis, 3 cases, 2357
- system analysis**, cancer chemotherapy, cell cycle, deoxyribonucleic acid, drug dose, drug resistance, model, mouse, 783
- extraocular muscle, eye movement, oculomotor nerve, saccadic eye movement, 883
- identification, information science, mathematic model, retina, 2045
- monosynaptic pathway, nerve cell network, 1731
- systolic blood pressure**, blood pressure, electrocardiography, automatic slope display, 652
- circulation model, mathematic model, monitoring, elastic reservoir, 1701
- table**, paraplegia, 290
- plethysmography, automatically angiological tilting table, 1919
- tablet**, computer, counting, pharmacy, bar code recorder, 1984
- tachometer**, movement, 1907
- tachycardia**, artificial heart pacemaker, electromagnetic radiation, heart arrhythmia, radiofrequency pacemakers, 3690
- computer, heart arrhythmia, his bundle potential, extra stimulus measurement method, 3099
- tactile discrimination**, electrostimulation, stimulus properties, volunteers, 714
- nerve stimulation, powered prosthesis, sensory nerve, vibration, human, 1902
- tail**, electric shock, restraining device, stress, system, free moving rat, 2965
- tail regeneration**, information processing, least square method, lizard, 1436
- talipes equinus**, ankle, fracture external fixation, joint mobility, osteosynthesis, physiotherapy, rehabilitation, tibia fracture, foot movement plate, 3742

- tape recorder**, anesthesiology, recording, 2289
 - auscultation, heart sound, phonocardiography, 2198
 - behavior, simple device, 2236
 - digital computer, digital recording, code, 1767
 - electrocardiography, electroencephalography, multichannel recorder, telemetry, digital recording, 1360
 - electroencephalography, epilepsy, multichannel recorder, telemetry, 27 days recording, 976
 - evoked response audiometry, evoked somatosensory response, 675
 - instrumentation recorder, pulse code modulation, 113
- target**, computer model, eye movement, retina image, target point selection, 3 volunteers, 1698
- target movement**, cytophotometry, retina, retina bipolar ganglion cell, ribonucleic acid, stroboscopy, histochemistry, frog, 2632
- task performance**, attention, computer model, 1633
 - decision theory, fault diagnosis, 3504
 - digital computer, man machine interaction, 541
 - digital computer, display system, man machine interaction, 540
 - digital computer, man machine interaction, 1792
 - information processing, psychology, man, 1495
 - levodopa, movement, tremor, tracking task, portable instrument, 1880
 - man machine interaction, compensatory tracking, 417
 - man machine interaction, fault diagnosis, 3512
- taste**, electrogustometry, taste sensation, impulse stimulation, new method, 2993
- teaching**, intensive care, mental hospital, closed circuit television, 3723
- tear**, artificial tear, cornea epithelium, ocusert, tear film, 2991
- tear film**, artificial tear, cornea epithelium, ocusert, tear, 2991
- technetium 99m**, artery, atheroma, computer, macroaggregated albumin technetium 99m, ulcer, videorecording, dog, 1614
 - brain blood flow, brain blood volume, brain infarction, brain scintigraphy, brain tumor, carotid artery obstruction, transient ischemic attack, xenon 133, 43 cases, 2206
 - brain scintigraphy, computer assisted tomography, heart infarction, scintillation camera, 25 cases, dog heart infarction, emission computed tomography, maatec 99m, 1200
 - computer assisted tomography, edetate gallium ga 68, positron scintiscanning, scintillation camera, emission computer assisted tomography, comparison, 1177
 - generator, molybdenum 99, multifold generator, testing, 98
 - image processing, gamma radiation, radiocardiography, radioisotope, scintigraphy, 3378
 - radioactive contamination, vegetation, uptake, soybean and wheat, 941
- technetium pyrophosphate tc 99m**, bone scintigraphy, computer, methylene diphosphonate technetium tc 99m, computer assisted comparison of bone imaging, 350 patients, 2717
- technician**, medical instrumentation, paramedical education, public health service, 382
- teflon**, acetal, biocompatibility, cell culture, cytotoxicity, nylon, plastic, polyethylene, polystyrene, polyurethan, silastic, testing, 866
 - aluminum silicate, biocompatibility, serum protein, thrombocyte adhesiveness, 2001
- telemetry**, acceleration, parkinson disease, tremor, 40 patients, 523
 - accelerometer, leg movement, 1893
 - alertness, computer, electroencephalography, electromyography, rem sleep, sleep, rat, automatic analysis, 2111
 - ambulance, emergency, heart infarction, life support system, 3292
 - amplifier, electroencephalography, electromyography, interference, powerline interference, 1362
 - amplitude modulator, coherent quaternary modulation, phase modulation, 121
 - amplitude modulator, phase modulator, 2113
 - amplitude modulator, frequency modulation, generator, 3585
 - anesthetist, heart rate, hospital personnel, mental load, operating room, stress, 525
 - antenna, automatic antenna selector, 527
 - antenna, coaxial cable, tunnel, 3220
 - antenna, signal noise ratio, 964
 - antenna, cylindrical antenna, 962
 - antenna, implant, 1771
 - antenna, electromagnetic radiation, beam profile, yagi antenna, 3586
 - antenna, electromagnetic field, satellite, 2107
 - antenna, dipole characteristic, 3584
 - artificial heart pacemaker, electrocardiography, 965
 - artificial heart pacemaker, electrocardiography, frequency modulation, monitoring, telephone telemetry, 2678
 - balneology, duodenum ulcer, exercise, heart rate, kinesiotherapy, czechoslovakia, 522
 - balneotherapy, electrocardiography, monitoring, 969

- bioelectronics, bioenergy, direct current converter, power supply, solar cell, 3214
- blood pressure, exercise, 528
- body temperature, electromagnetic radiation, pressure measurement, fish, 968
- body temperature, electromagnetic radiation, heart rate, hibernation, squirrel, 967
- body temperature, computer, core temperature, small animals, 2112
- body temperature, diving, hyperbarism, dog, 1000 fsw, 3582
- brain, capacitance transducer, electromagnetic radiation, intracranial pressure, pressure transducer, epidural implantation, 971
- brain tumor, cerebrospinal fluid, electrocardiography, electroencephalography, hematoma, intracranial hypertension, pneumoencephalography, 20 cases, continuous recording, technique, 1487
- breathing rate, electrocardiography, heart rate, lung ventilation, sailor, ship, skin temperature, workload, seagoing ship, 524
- cerebral palsy, electromyography, gait, hemiparesis, muscular dystrophy, temporal information, 100 cases, 1904
- cerebrospinal fluid pressure, improved measurement instrument, 2109
- cinematography, electromyography, gait, analysis method, daily orthopedic practice, 843
- coil, implant, power supply, coil design, 2108
- computer, electrocardiography, heart rate, one line measurement, bird, 2375
- computer, electroencephalography, 3 channel, automatic noise rejection, 966
- computer, computer program, electrocardiography, electric noise, artefact suppression, noise rejection, 2867
- data reduction, data transmission, electrocardiography, vectorcardiography, 1773
- data reduction, data transmission, electrocardiography, information processing, microprocessor, 1944
- data transmission, image processing, wave guide, 3218
- data transmission, review, 963
- data transmission, signal, d.c directional coupler, 961
- diode, mixing, receiver, signal noise ratio, 119
- display system, electrocardiography, movement, television, 1354
- doppler ultrasound flow meter, implantation, design, dog, 3622
- electrocardiography, respiration, low power, 529
- electrocardiography, phonocardiography, 2931
- electrocardiography, electroencephalography, multichannel recorder, tape recorder, digital recording, 1360
- electrocardiography, electromagnetic radiation, signal noise ratio, los angeles, 1359
- electrode, electroencephalography, epilepsy, telephone telemetry, 975
- electroencephalography, 12 channel, design, 118
- electroencephalography, epilepsy, paroxysmal activity, 2868
- electroencephalography, epilepsy, multichannel recorder, tape recorder, 27 days recording, 976
- electroencephalography, electromagnetic radiation, psychiatry, 972
- electroencephalography, electromyography, sleep, rat, fm-am transmitter, 2110
- electroencephalography, electrooculography, epilepsy, sleep, videorecording, automatic analysis, visual analysis, video recording, closed circuit, 1884
- electromagnetic radiation, usa, 974
- electromagnetic radiation, emergency, usa, 973
- electromagnetic radiation, intracranial pressure, monitoring, temperature, 1361
- electromagnetic radiation, microwave radiation, neurotransmitter, receiver, 183
- electromyography, gait, movement, volunteer, 1769
- environment, water pollution, water depth, bottom feature, 2494
- evoked cortical response, evoked visual response, miniature system, rat, 530
- fetus heart rate, fetus monitoring, pregnancy, evaluation, hewlett packard 78100a, 521
- force transducer, implant, muscle contraction, uterine tube, monkey, 1770
- frequency modulation, generator, voltage controlled oscillator, 519
- frequency modulation, generator, voltage frequency converter, voltage controlled oscillator, 549
- frequency modulation, phase locked discriminator, fm detector, 123
- frequency modulation, microelectrode, nerve cell potential, compact miniature system, rat, rabbit, 2619
- frequency modulation, phase lock amplifier, 1772
- generator, voltage controlled oscillator, 3215
- infrared radiation, laser, light modulator, spectrometry, monochromate, carbon dioxide laser, 2900
- integrated circuit, monitoring, multichannel recorder, 970
- intracranial pressure, monitoring, pressure transducer, rotterdam epidural teletransducer, 2493
- intracranial pressure, monitoring, device, 2492
- light modulator, 288 mhz, 2896
- lung function, oxygen consumption, oxygen electrode, respiration, transducer, 2106
- medical engineering, review, design, 2115
- microprocessor, telecommunication, 2880
- monitoring, operating room, 4 channels, 750

- monitoring, spine, stress, radioendosonde, 2105
- multiplexer, 120
- optoelectronic transducer, calibration, 35
- radiotransmitter, snap harness, rat, 3583
- wild life, identifier, 1358
- multichannel, 117
- method, 116
- entropy coding, pulse code modulation, 122
- telephone**, audiometry, head phone, calibration, frequency response, 1431
 - physical disability, electronic dialing device, 2640
- telephone telemetry**, artificial heart pacemaker, electrocardiography, frequency modulation, monitoring, telemetry, 2678
 - computer, electrocardiography, remote analysis, 978
 - data transmission, image processing, signal noise ratio, television, 1930
 - electrocardiography, 3 lead ecg, post office telephone line, 977
 - electrode, electroencephalography, epilepsy, telemetry, 975
 - electroencephalography, standards, method, apparatus, 238
 - hearing aid, speech intelligibility, 203 subjects, auxiliary equipment, 3219
 - scintiscanning, telephone line transmission, 1768
- telescope**, aneurysm, endoscopy, hypophysis adenoma, lumbar disk, sella turcica, endoscopy, apparatus, neurosurgery, hopkins telescope, 666
 - myopia, vision, dioptric setting, light level, 1409
- television**, amplifier, 532
 - atherosclerosis, capillary flow, diabetes mellitus, hypertension, microscopy, skin capillary, vital television capillary microscopy, 3285
 - checkerboard, evoked visual response, pattern generator device, 242
 - counter, leukocyte, pattern recognition, hematrak differential counter, 628
 - data transmission, image processing, signal noise ratio, telephone telemetry, 1930
 - densitometry, image processing, minicomputer, 124
 - display system, electrocardiography, movement, telemetry, 1354
 - eye surgery, microsurgery, ceiling mounted unit, 3400
 - image intensifier, roentgen radiation, roentgen diffraction, 3786
 - image processing, 3592
 - indirect ophthalmoscopy, ophthalmoscopy, videorecording, 2253
 - jaw, lip, movement, 1031
 - lens, stroboscopy, vocal cord, amplitude determination, 3309
 - medical education, videorecording, 412
 - monitoring, radiotherapy, closed circuit television, problematic patient, 3768
 - visual tracking, wildlife, 995
 - circle generator, cross-hatch generator, 1095
- television camera**, computer memory, image processing, minicomputer, 2514
 - microscopy, positioning device, spectrometry, ccd, 2541
 - resolving power, vidicon, emr, photoelectric, 3597
- temperature**, anesthetic agent, blood chemistry, blood pressure, computer, electroencephalography, monitoring, open heart surgery, patient monitoring system, 350
 - body plethysmography, 2611
 - computer model, nerve conduction, nerve potential, axon branch point, squid, 2474
 - electric organ, potassium channel, sodium channel, electric fish, 76
 - electromagnetic radiation, intracranial pressure, monitoring, telemetry, 1361
 - electroretinography, light, retina, combined sensor, 1519
 - endoprosthesis, metal prosthesis, ultrasonics, rabbit, 191
 - eye, temperature recording, measurements, rabbit, experimental and theoretical study, 2129
 - heat transfer, thermography, gradient in low flow vessel, 3200
 - integrator, monitoring, steam sterilization, 199
 - lens potential, ouabain, potassium, oil chamber, bovine lens, asymmetry potential, 2243
 - plethysmography, pressure, pressure transducer, volume, thermal problems, 949
 - selective amplifier, stability, 3575
- temperature control**, blood sampling, catheter, cold, intravenous infusion, catheter content control, sheep, 2938
 - cooling system, heater, peltier effect, dc proportional temperature controller, 2173
- temperature recording**, eye, temperature, measurements, rabbit, experimental and theoretical study, 2129
- temporal artery**, dynamography, ophthalmic artery, ophthalmodynamography, basic principles, methods, monograph, 251
- temporal lobe epilepsy**, age, brain cortex, computer assisted tomography, hemianopia, hemiparesis, partial epilepsy, 11 out of 500 children, 788

- computer assisted tomography, cost benefit analysis, diagnosis, epilepsy, headache, 107 cases, u.s.a., 1209
- temporomandibular joint**, elasticity, model, small forces, model, human, 49
- tendon**, biomechanics, forelimb, intraarticular pressure, joint, ligament, race horse, 2805
- tendon reflex**, achilles reflex, analog computer, time measurement, photomotogram, 1619
- tensile strength**, bone strength, elasticity, long bone, tibia, dog, 429
 - laser, wound healing, rat, 2031
 - poly(methacrylic acid methyl ester), stainless steel, wire fixation, 1526
- tensiometer**, computer, muscle fiber contraction, muscle tone, electro optical transducer, tension fluctuation, single muscle contraction, 2422
- tension**, skin, measurement, low-pressure suction device, 2414
- tension headache**, anxiety, biofeedback, electromyography, epilepsy, insomnia, paralysis, spasticity, clinical application, review, 1081
- tensor tympani muscle**, electrostimulation, middle ear, reflex time, tongue, bipolar electric stimulation, device, 1506
- testis**, kidney, liver, radiation hazard, ultrasonics, rabbit, 1828
- testis cancer**, chorionic gonadotropin, computer assisted tomography, alpha fetoprotein, retroperitoneal cancer, 4 cases, 3822
- tetracaine**, chlorpromazine, synaptosome membrane, structural rearrangements, rat, guinea pig, 390
- tetradotoxin**, SEE tetrodotoxin
- tetraphenylborate sodium**, lipid membrane, membrane potential, voltage clamp, bilayer membrane, 3173
 - lipid membrane, membrane potential, electrostatic interaction, 2472
- tetrodotoxin**, barium, computer model, nerve cell membrane potential, aplysia, 2467
 - fat, model, pacemaker nerve cell, potassium channel, semiconductor, 926
 - hodgkin huxley equation, nerve fiber membrane potential, sodium channel, 931
 - nerve fiber membrane potential, nerve fiber potential, sodium pump, myxicola, 1326
- thalamus**, attenuated virus, central nervous system, live vaccine, lumbar spine, mathematic model, neurovirulence, poliomyelitis virus, virus, virus virulence, neurovirulence assay, monkey, 3492
 - brain, brain ventricle, echography, two dimensional scanning of excised brain, normal anatomy, 1496
 - computer, data base, stereotaxic surgery, automatic thalamus mapping, 130 cases, 856
 - herpes zoster, nerve stimulation, neuralgia, pain, phantom pain, 46 cases, electrode placement, 249
- thalamus hemorrhage**, computer assisted tomography, gaze paralysis, hemiplegia, miosis, 18 cases, 814
- thallium 201**, angina pectoris, heart muscle, image processing, infarction, radioisotope, 2287
 - dosimetry, radiation exposure, nuclear parameter, 301
- theobromine**, caffeine, calcium, cell membrane, egg, methyladenine, oogenesis, theophylline, hormone surface interaction, scanning electron microscopy, starfish, 3716
- theophylline**, caffeine, calcium, cell membrane, egg, methyladenine, oogenesis, theobromine, hormone surface interaction, scanning electron microscopy, starfish, 3716
- therapy**, abdominal wall, computer assisted tomography, radiotherapy, tumor, whole body radiation, 16 years old girl, 1181
 - breast carcinoma, computer, radiotherapy, computer aided medical decision making, 25 cases, 1593
 - cobalt therapy, computer assisted tomography, radiation isodose distribution, phantom, 3075
 - computer, linear accelerator, radiotherapy, 2334
 - computer, computer assisted tomography, radiotherapy, method, 3417
 - computer, linear accelerator, tissue maximum ratio, 2359
 - computer, radiotherapy, 3 dimensional treatment planning system, 3083
 - computer assisted tomography, radiotherapy, 3831
 - computer assisted tomography, radiotherapy, efficiency, 2726
 - computer assisted tomography, echography, radiotherapy, cross section determination, 2360
 - computer assisted tomography, radiotherapy, 3843
 - megavoltage radiotherapy, radiation depth dose, physical characterization, 597
 - megavoltage radiotherapy, radiation depth dose, computer, 3669
 - radiation field, radiotherapy, field recording, photographic method, 1132
- thermal radiation**, infrared radiation, 3245
- thermal stimulation**, lipid membrane, bilayer membrane, 1251
- thermal trauma**, burn, echography, determination, 2264
- thermistor**, anemometry, respiration, shunted sensor, 1871
 - boiling point, solution, thermometer, boiling point elevation, 2130
 - environment, recording, thermometer, water quality, 1799
 - heart output, thermodilution curve, determination, small animal, 1046
 - manometry, vacuum, pirani gauge, 3620
 - thermometer, linearization, 2530
- thermocouple**, crystal, magnesium, ionic thermocurrent measurement, 162
 - environment, psychrometer, automatic scanning, 608
- thermode**, brain cortex, cooling, peltier effect, local cooling, 2974

- thermodilution**, dye dilution curve, heart output, monitoring, open heart surgery, 633
- thermodilution curve**, computer, heart output, evaluation flow bench, 3101
 - computer, computer program, heart index, heart output, on line computation, 850
 - heart output, thermistor, determination, small animal, 1046
- thermodynamics**, actin f, muscle contraction, elastic modulus, actin actin bond strength, thermodynamics, conformational change, 1267
 - biophysics, epidermis, skin, nondestructive measurement, 3151
 - cell membrane, ion transport, mathematic model, membrane, osmotic pressure, 2437
 - cell membrane, ion transport, mathematic model, membrane, osmotic pressure, 2436
 - cell membrane, electromagnetic radiation, microwave radiation, non thermal effects, 1833
 - cell membrane permeability, epithelial cell, mathematic model, tracer flux ratio, 896
 - cell membrane permeability, erythrocyte membrane, naphthalene sulfonate derivative, 3152
 - cell membrane potential, fluorescence, nerve cell membrane potential, 2838
 - cell membrane potential, ion transport, mathematic model, 1676
 - chemical kinetics, model, poikilothermy, 208
 - diffusion, heat conduction, nonlinear system, diffusion equation, 1280
 - electromagnetic field, skin, measurements, review, 2429
 - energy transfer, heart work, mathematic model, 1678
 - exercise, mathematic model, muscle, muscle temperature, thigh muscle, analytical solution, human, 2434
 - flow, mathematic model, urinary tract, parallel flow tube, 2061
 - heat transfer, tissue, 3153
 - membrane, 2430
 - molecular biology, nerve fiber membrane, nerve potential, squid, rabbit, 1677
 - molecular structure, ising chain, 2432
 - muscle contraction, mechanochemical system, 3526
 - muscle contraction, 1679
 - sweat gland, thermoregulation, heat pipe theory, 209
 - general notions, 2041
- thermoelectricity**, biopolymer, seebeck coefficient, 2544
- thermogenesis**, heat exchanger, thermoregulation, intravascular exchanger, goat, 451
- thermography**, brain, digital filtering, heart infarction, image processing, scintigraphy, scintillation camera, 1929
 - brain ischemia, skin temperature, sympathetic nerve, new apparatus, 2563
 - breast, diagnosis, information processing, 1940
 - breast carcinoma, computer, computer thermography, 356
 - digital computer, echography, image processing, nuclear magnetic resonance, radiography, reprography, 3459
 - electromagnetic radiation, radiation absorption, 449
 - head, microwave radiation, radiation absorption, man, monkey, 1819
 - heart failure, newborn, 37 newborns, diagnostic methods, 578
 - heat transfer, temperature, gradient in low flow vessel, 3200
 - infrared radiation, 3783
 - thermometer, 2532
 - vidicon, 2117
- thermoluminescence**, cobalt 60, dosimetry, fast electron radiation, lithium fluoride dosimeter, gamma radiation, radiotherapy, 1129
 - dosimetry, gamma radiation, automation, 1015
 - dosimetry, function generator, heater, heating rate, 592
 - dosimetry, gamma radiation, radiotherapy, signal noise ratio, differential method, 3788
- thermoluminescence dosimeter**, beta radiation, graphite mixed case 4 dy teflon disk, 2158
 - beta radiation, gamma radiation, lif response, effect of annealing, 2156
 - calcium fluoride dosimeter, lithium fluoride dosimeter, neutron radiation, radiotherapy, 1920
 - computer assisted tomography, gonad radiation, radiation exposure, 121 cases, emi scan, 2727
 - dosimetry, heavy particle radiation, ionization chamber, x ray film, radiation activation detector, radiobiological experiment, 1342
 - environmental monitoring, internal background build up measurement, 1422
 - environmental monitoring, ionization chamber, nuclear reactor, population exposure, vermont yankee nuclear power station, 1335
 - fast electron radiation, megavoltage radiotherapy, gamma radiation, lif response, 1131
 - fast electron radiation, monte carlo calculation, 3375
 - megavoltage radiotherapy, neutron spectrometry, radiation field, 2279
 - neutron dosimetry, cellulose nitrate film, personnel monitoring, 1539
 - gamma radiation, zirconium dioxide dosimeter, 1423
 - thermal annealing, 2157

- topaz crystals, 3389
- thermometer**, anemometry, hot wire anemometry, 546
 - boiling point, solution, thermistor, boiling point elevation, 2130
 - environment, recording, thermistor, water quality, 1799
 - thermistor, linearization, 2530
 - thermography, 2532
 - thermostat, 3614
- thermometry**, cancer, hyperthermia, localized hyperthermia, 3525
 - diathermy, skin burn, diathermic microthermometry, 3745
- thermopile**, excitation contraction coupling, heart papillary muscle, heart right ventricle, metal film thermopile, rabbit, frog, 2600
- thermoregulation**, body, heat transfer, homeothermia, mathematic model, newborn, body insulation, critical size, 897
 - body temperature, newborn, temperature measurement, mouse, 2580
 - body temperature, breathing work, compartment model, lung ventilation perfusion ratio, panting, respiration control, dog, 1699
 - heat exchanger, thermogenesis, intravascular exchanger, goat, 451
 - protective clothing, skin temperature, water cooling, water perfused suit, 1440
 - sweat gland, thermodynamics, heat pipe theory, 209
- thermostat**, cryostat, flow cryostat, 3616
 - incubation, differential control, 1800
 - oven, 3615
 - thermometer, 3614
 - 3613
 - small preparations, 1797
- thesauros**, diagnosis, medical record, german thesaurus, compatibility, 1612
- theta rhythm**, alpha rhythm, beta rhythm, computer, delta rhythm, electroencephalography, 306 subjects, normal value, computer analysis, 2705
 - alpha rhythm, artifact, automation, delta rhythm, drowsiness, electroencephalography, 31 subjects, artifact rejection, 1947
- thin layer chromatography**, aminoacid, chromatography, electrophoresis, skin, urea, method, device, 3746
 - computer, scintiscanning, pdp 12, 754
- thiourea**, autoradiography, image intensifier, radiography, image improvement, underexposed radiography, 3391
- third brain ventricle**, age, brain sulcus, brain ventricle, computer assisted tomography, cella media, 100 normal adults, 3443
 - brain arachnoid cyst, computer assisted tomography, hydrocephalus, pneumoencephalography, sella turcica, case report, man of 19, neurosurgery, 1588
- thoracic aorta**, age, aorta strip, aorta wall, collagen, elasticity, human, 59-82 yr, 44
 - aorta, artery wall compliance, plethysmography, measurement, modeling, dog, 2598
- thoracic duct**, cannulation, continuous infusion, mice, procedure, 1839
- thorax**, abdomen, computer assisted tomography, 3447
 - biological model, biomechanics, cadaver, injury, 3137
 - cartilage, model, finite element analysis, 1671
 - computer, lung compliance, lung mechanics, mathematic model, least square method, modified forced oscillation technique, 1270
 - computer assisted tomography, liver, pancreas, 354
 - fast electron therapy, roentgen dose distribution, small angle pendulous radiotherapy, 741
 - heart output, impedance plethysmography, plethysmography, thorax impedance, output computation, 2203
 - injury, model, 3307
 - magnetic field, magnetocardiography, mathematic model, 934
 - tomography, method, 1536
- thorax electric field**, body, electrocardiography, mathematic model, 1314
 - body posture, electrocardiography, heart infarction, heart rate, st segment, 35 precordial leads, method, 1049
 - computer, digital computer, electrocardiography, exercise, precordial isopotential map, 1235
 - coronary care unit, electrocardiography, precordial ecg mapping, 3693
- thorax impedance**, defibrillation, human, measurement, 3712
 - defibrillation, electrode, electrode paste, skin, paddle electrode paste, comparison, 2190
 - heart output, impedance plethysmography, plethysmography, thorax, output computation, 2203
 - impedance plethysmography, lung edema, plethysmography, edema measurement method, 2216
- thorax movement**, kinetocardiography, magnetic noncontact apexcardiography, 10 normal subjects, 1444
- thorax radiography**, cancer diagnosis, computer assisted diagnosis, lung carcinoma, 482 cases, 2724
 - computer, diagnosis, lung, radiography, 2316
 - heart volume, inherent mathematical error factor, 3705

- thorax wall**, artificial heart pacemaker, magnet, 15 different implanted demand pacemakers, malfunction evaluation, magnet waving, electrical chest wall stimulation, 1452
- artificial heart pacemaker, electrode, skin electrode, stimulation, external pacemaker, stimulation through subcutaneous pin electrodes, 2192
 - computer assisted tomography, lung parenchyma, 3067
 - densitometry, heart, lung cancer, lung cyst, lung emphysema, mediastinum, 33 thoracic tomodensitometers, 1061
- threshold**, computer, nerve cell, stimulus, 2757
- thrombocyte**, acrylonitrile, biocompatibility, blood, structure, 383
- artery graft, biocompatibility, blood, cell kinetics, prosthesis, thrombosis, 3
 - artificial kidney, dialysis membrane, erythrocyte, leukocyte, blood component deposited, electron microscopy, 621
 - blood cell count, erythrocyte, laser, leukocyte, laser beam optics, hemac 6301, 570
 - blood clotting, surface, blood surface interaction, hydrogel interfaces, 1037
 - calcium, may hegglin malformation, normal values, method, atomic absorption spectrometry, 618
- thrombocyte adhesiveness**, aluminum silicate, biocompatibility, serum protein, teflon, 2001
- thrombocyte aggregation**, cell aggregation, glanzmann disease, staphylococcus aureus, willebrand disease, measurement device, 3283
- thrombocyte count**, arteriovenous shunt, biocompatibility, blood clotting, oxygenator, polysiloxane, silastic, lamb, 1869
- automation, circadian rhythm, hematocrit, hemoglobin, leukocyte count, differential count, hemalog d, 3685
 - computer, particle counter, computer, 2688
 - coulter counter, special technique, whole blood, 3279
 - electronic particle counting, thrombocytopenia, 1939
 - semiautomated system, 1443
- thrombocytopenia**, electronic particle counting, thrombocyte count, 1939
- thrombogenesis**, computer, heart valve prosthesis, mathematic model, tilting disk prosthesis, thrombogenic site prediction, 1236
- plastic implant, polymer, vein catheterization, 3286
- thrombogenicity**, heart valve prosthesis, testing, 1463
- thrombosis**, angiocardiology, catheter, embolism, heart catheterization, pigtail catheter, different sideholes numbers, catheter comparison, 3754
- anticoagulant agent, computer program, dose response, long term control, 1172
 - artery graft, biocompatibility, blood, cell kinetics, prosthesis, thrombocyte, 3
 - calf, vein blood flow, external pressure, 11 normals, 2202
 - copper, prosthesis, antithrombogenic properties, artificial surface, 1245
 - embolism, heart valve prosthesis, quest for perfect valve, 1458
- thrombosis prevention**, embolism prevention, heel, postoperative complication, support, heel support device, 2925
- heart prosthesis, prosthetic material, surface characteristics, in vivo, 634
- thrombus**, atherosclerosis, blood flow, tube, bifurcation, particle behavior, 2459
- thumb**, biomechanics, hand, hand function, static forces, 42
- thymectomy**, cellular immunity, corona virus, immune deficiency, mononuclear granulocyte, mouse hepatitis virus, spleen cell transplantation, T lymphocyte, virus infection, 3402
- thymoma**, computer assisted tomography, myasthenia gravis, tomography, 6 cases, 3415
- thyristor**, microprocessor, power control, power supply, digital control, 2491
- power supply, inverter, 960
- thyroid function test**, algorithm, coding, computer, 2305
- thyroid gland**, americium, fluorescent scanning, iodine, gamma radiation, concentric source detector design, 308
- analog computer, hypophysis, hypothalamus, thyrotropin, thyroxine, simulator, 1148
 - computer assisted tomography, diatrizoate, 1591
 - computer model, thyroid hormone, assay, 1938
 - electromagnetic radiation, heating, microwave radiation, thyroxine, triiodothyroxine, dog, 2566
- thyroid hormone**, computer model, thyroid gland, assay, 1938
- thyrotropin**, analog computer, hypophysis, hypothalamus, thyroid gland, thyroxine, simulator, 1148
- thyroxine**, analog computer, hypophysis, hypothalamus, thyroid gland, thyrotropin, simulator, 1148
- computer program, drug protein binding, ligand, serum albumin, 1153
 - electromagnetic radiation, heating, microwave radiation, thyroid gland, triiodothyroxine, dog, 2566
- tibia**, bone strength, elasticity, long bone, tensile strength, dog, 429
- femur, joint, position control, schistocerca, 3149
 - femur, leg lengthening, extension nail, 2643
 - tibia fracture, normal human bone, sex difference, strength, bending strength, torsion strength, 2418
- tibia fracture**, ankle, fracture external fixation, joint mobility, osteosynthesis, physiotherapy, rehabilitation, talipes equinus, foot movement plate, 3742

- biomechanics, fracture healing, internal junction, 2030
- fracture, fracture healing, cyclic loading, rabbit, 1273
- tibia, normal human bone, sex difference, strength, bending strength, torsion strength, 2418
- tibialis anterior muscle**, ankle, biomechanics, muscle strength, strength duration curve, model, dog, 287
 - computer, electromyography, motor unit potential, 4 subjects, automatic analysis, computer, 3427
- tibial nerve**, evoked cortical response, orbital cortex, splanchnic nerve, vagus nerve, nerve stimulation, cat, 2973
- tibia osteotomy**, biomechanics, femur osteotomy, knee, stress correction, 2798
- tidal volume**, arterial carbon dioxide tension, breathing, lung ventilation, time series, cluster analysis, dog, 2954
 - computer, electrocardiography, exercise, heart rate, lung function, oxygen consumption, breath-by-breath respiratory measurements, 1615
- tilting**, camera, ergonomics, tremor, 2131
 - cornea reflex, eye movement, head movement, eye rotation, torsional movement, human, 446
- time**, consonant, speech, 547
 - hodgkin huxley equation, nerve cell membrane, nerve cell membrane capacitance, nerve cell potential, renshaw cell, repetitive firing, model, 1724
 - integration, digital integration, 136
- time measurement**, achilles reflex, analog computer, tendon reflex, photomogram, 1619
- timer**, oscilloscope, pulse, pulse stretcher, 548
 - transistor logic, 945
- tissue**, acoustic impedance, erythrocyte, kidney, liver, muscle, sound velocity, ultrasonics, viscosity, shear acoustic impedance, 58
 - anatomy, cell structure, embryogenesis, gastrulation, mathematic model, 3510
 - blood, bone, compartment model, fourier transform, markov model, 2778
 - heat transfer, thermodynamics, 3153
 - magnetic field, oxygen tension, oxygen movement, 2829
 - magnetic field, 2543
- tissue culture**, acetylcholine, muscle fiber, voltage clamp, in vitro, chicken, 92
 - axoplasm flow, computer, mitochondria, spinal cord, mouse, 3272
- tissue equivalent**, argon, dosimetry, heavy particle radiation, 726
 - beta radiation, dosimetry, phantom, gamma radiation, radiotherapy, roentgen radiation, 2928
- tissue fixation**, brain, experimental animal, perfusion, simple apparatus, whole animals, rodents, brain fixation, pressure control, 1073
 - freezing, frozen section, fast freezing device, freeze etch replication, 3206
- tissue typing**, antilymphocyte serum, HL A antigen, lymphocyte, command processor, 2297
- tissue water**, dielectric constant, microwave radiation, muscle, rotational water mobility, 184
- titanic acid**, bone piezoelectric potential, ceramics, cortical bone, dielectric constant, silicon dioxide, ultrasonics, human, 75
- T lymphocyte**, acute lymphoblastic leukemia, B lymphocyte, computer, data base, clinfo, 2365
 - adhesion, chromium 51 labelled lymphocyte, lymphocyte, mathematic model, rat, lymphocyte adhesion, 8
 - cellular immunity, corona virus, immune deficiency, mononuclear granulocyte, mouse hepatitis virus, spleen cell transplantation, thymectomy, virus infection, 3402
- toluidine blue i 131**, computer, parathyroid gland, parathyroid scintiscanning, pertechnetic acid tc 99m, radium, scintiscanning, preoperative localization, 3440
- tomography**, cervical spine traction, myelography, traction device, 2274
 - circular tomography, linear tomography, comparison of diagnostic value, 2277
 - collimator, gamma radiation, coincidence scanning, 1915
 - computer assisted tomography, myasthenia gravis, thymoma, 6 cases, 3415
 - computer assisted tomography, orbit, orbit tumor, 213 cases, 1189
 - computer assisted tomography, face, skull, 1580
 - computer assisted tomography, endoscopic retrograde cholangiopancreatography, kidney disease, liver disease, liver scintiscanning, pancreas disease, retroperitoneal disease, 359
 - computer assisted tomography, comparison, 3076
 - dose, linear tomography, automatic dose rate control, 2728
 - echocardiography, application, 3264
 - fourier transform, model, modulation transfer function, linearding mechanism, 3756
 - hydrogen, nuclear magnetic resonance, phantom, rat, 3638
 - image processing, photography, radiography, camera, photographic reconstruction, 3787
 - image production, multidimensional tomography, reconstruction from sinogram, 3385
 - image quality, modulation transfer function, 2310
 - modulation transfer function, blurring effect, 1755
 - nuclear magnetic resonance, 2481
 - positron camera, positron emission tomography, object reconstruction, 3051
 - thorax, method, 1536

- opticophotographic image reconstruction, 692
- tomoscintigraphy**, computer assisted tomography, half back projection, 3421
- computer assisted tomography, computer program, modulation transfer function, scintillation camera, evaluation of depth effect, 2347
- tone**, auditory masking, hearing, signal noise ratio, 454
- behavior, hearing, reaction time, restraining device, cat, 2245
- tone burst**, binaural hearing, hearing, onset, ongoing, offset, temperal difference, 61
- evoked acoustic nerve response, evoked brain stem response, high pass filter, response amplitude, 3323
- tongue**, electrostimulation, middle ear, reflex time, tensor tympani muscle, bipolar electric stimulation, device, 1506
- tonic clonic epilepsy**, brain atrophy, central nervous system metastasis, computer assisted tomography, electroencephalography, encephalitis, epilepsy, partial epilepsy, 99 cases, 829
- tonography**, intraocular pressure, ophthalmic artery, new instrument, 3269
- tonometry**, applanation tonometry, glaucoma, intraocular pressure, 2 new types, patients, normal subjects, 2247
- tooth**, mandible, periodontal membrane, mechanic behavior, 894
- nerve potential, pain, sensory nerve, recording method, 674
- tooth care**, computer, data base, education, gingiva, oral biopsy, oral biopsy data, 8 dental schools, usa, 3471
- tooth drill**, laser, light modulator, 178
- tooth radiography**, computer, optic density, 2354
- topography**, brain mapping, electroencephalography, method, 927
- torture**, equipment investigation, 505
- total hip prosthesis**, acrylic acid, femur, prosthesis, stress, charnley prosthesis, 2261
- aluminum oxide, ceramics, polyethylene, tribologic aspects, 1622
- ceramics, hip prosthesis, metal, 30 patients, 278
- ceramics, ceramic endoprosthesis fatigue strength, 283
- femur greater trochanter, methacrylic acid methyl ester, osteotomy, surgical technique, carbide drills, prosthesis extraction, 2383
- hip, lubricating agent, lubrication, prosthesis, synovial fluid, 3145
- leg, orthosis, splint, case report, 3000
- 95 follow up cases, 2641
- total lung volume**, airway resistance, plethysmography, measurement apparatus, infant, 1935
- airway resistance, body plethysmography, computer, manual vs automated method, 231
- touch**, artificial skin, back, disabled, hand prosthesis, skin, 1908
- blindness, pattern recognition, visual aid, 'tactile' vision, 697
- blindness, deafness, display system, electrostimulator, 2981
- computer, bibliography, 1983
- deafness, speech, 2629
- deafness, hearing, speech, 3352
- image processing, position transducer, tactile imaging, 980
- toxicology**, calculator, drug screening, programmable calculator, 3791
- computer, protocol study, computer program, 1937
- toy**, biofeedback, electromyography, rehabilitation, myodisplay instrument, child, 279
- trabecular meshwork**, aphakia, cornea transplantation, intraocular pressure, mathematic model, 2800
- trace element**, electron probe microanalysis, fast proton radiation, 3564
- fluoroscopy, soft tissue, sample mass determination, 2902
- liver, neutron activation analysis, determination of bulk and trace elements, bovine liver, 2894
- tracer**, SEE isotope tracing
- trachea**, blood flow, trachea mucosa, trachea tube, cuff pressure, dog, 1483
- bronchus, ciliary motility, computer, dogs, new measuring technique, 1237
- trachea injury**, cuff, endotracheal intubation, tracheotomy tube, comparison of 5 types, dog, 3310
- trachea mucosa**, blood flow, trachea, trachea tube, cuff pressure, dog, 1483
- trachea prosthesis**, proplast, dog, histology, 1065
- trachea tube**, airway obstruction, polyvinylchloride, polyvinyl chloride tube, obstruction, 1543
- blood flow, trachea, trachea mucosa, cuff pressure, dog, 1483
- tracheotomy**, infant, newborn, infant tracheal retractor, 3266
- tracheotomy tube**, cuff, endotracheal intubation, trachea injury, comparison of 5 types, dog, 3310
- traffic**, air pollution, electronics, future development, 1476
- computer program, motorized transport, statistics, stochastic model, vehicle degradation, safety inspection, 1630
- environment, model, noise generator, noise pollution, spectrometry, 1426
- traffic accident**, acceleration, blunt trauma, deceleration, trauma, velocity, tolerance to impact acceleration, 2803
- safety, decision theory model, environmental safety improvement, danger compensation, 2010
- training**, computer, performance, quality control, sport, decathlon, model analysis, computer generated scoring tables, 3475

- hospital personnel, medical record, mental hospital, problem oriented record, 2370
- transcutaneous stimulation**, artifact, electrocardiography, electroencephalography, model, skin abrasion, skin dystrophy, skin injury, skin potential, sweating, wound healing, 3234
- transducer**, adenosine diphosphate, adenosine triphosphate, model, muscle contraction, quantum theory, sliding filament theory, quantum mechanical transducer model, 2033
 - cell membrane, displacement transducer, 509
 - colorimetry, 572
 - communication, disabled, prosthesis, morse decoding system, 1117
 - drinking device, integrated circuit, licking, device, 1350
 - electrocardiography, monitoring, pulse, skin conductance, volume, multifunction transducer, 1142
 - image, roentgen radiation, charge-coupled device, 1778
 - intestine, intestine motility, smooth muscle, implantation, dog, 3272
 - lung function, oxygen consumption, oxygen electrode, respiration, telemetry, 2106
 - piezoelectricity, 3571
 - piezoelectricity, distortion, 508
 - piezoelectric transducer, response optimization, correcting circuit, 950
- transfer**, latent period, motor nerve, nerve conduction, signal processing, 1751
- transient ischemic attack**, brain blood flow, brain blood volume, brain infarction, brain scintigraphy, brain tumor, carotid artery obstruction, technetium 99m, xenon 133, 43 cases, 2206
 - brain hemorrhage, computer assisted tomography, 6 cases, 3846
- transient recorder**, averaging, multichannel, 985
- transient response**, blood flow, body temperature, heart output, mathematic model, skin temperature, human thermoregulation, 448
 - computer model, linear system, differential equation, 138
 - electrostimulator, sweep generator, frequency response, sine wave stimulator, 2976
- transparency**, adhesive agent, epidermis horny layer, transparency patterns, adhesive tape strip series, apparatus, 3006
- transverse tubular system**, muscle fiber membrane capacitance, muscle fiber membrane resistance, low frequency impedance, frog, 1719
- trauma**, acceleration, blunt trauma, deceleration, traffic accident, velocity, tolerance to impact acceleration, 2800
 - biomechanics, cervical spine, 1275
 - brain atrophy, brain hemorrhage, computer assisted tomography, head trauma, hydrocephalus, skull fracture, subdural hematoma, diagnosis, 1581
 - computer, mathematic model, multiple trauma, nomogram, prognosis, respiration, 2 prognostic indices, 172 cases, 426
 - computer, mathematic model, mortality, multiple trauma, trauma indices, predictions, 425
 - disaster, monitoring, stethoscope, war, 1141
- traumatic epilepsy**, brain atrophy, computer assisted tomography, electroencephalography, epilepsy, head trauma, 78.070.297.P cases, 2330
- treadmill**, locomotion, motor driven, cat, 705
- tremor**, acceleration, parkinson disease, telemetry, 40 patients, 523
 - accelerometer, ataxia, encephalopathy, triaxial accelerometer, 3334
 - camera, ergonomics, tilting, 2131
 - capacitance transducer, parkinson disease, measuring device, variable, 2963
 - computer, differential diagnosis, display system, hand, information processing, parkinsonism, 1240
 - levodopa, movement, task performance, tracking task, portable instrument, 1880
- trephine**, lacrimal duct, new device, surgical technique, 3398
- triceps surae muscle**, electromyography, fatigue, muscle performance, total torque, weighted emg sum, man, 2029
- trichloroacetic acid**, mathematic model, trichloroethanol, trichloroethylene, uptake, excretion, metabolism, mathematical model, 381
- trichloroethanol**, mathematic model, trichloroacetic acid, trichloroethylene, uptake, excretion, metabolism, mathematical model, 381
- trichloroethylene**, mathematic model, trichloroacetic acid, trichloroethanol, uptake, excretion, metabolism, mathematical model, 381
- trigger**, aorta balloon, artery counter pulsation, assisted circulation, computer, electrocardiography, optimum performance determination, 3098
 - averaging, sampling, time jitter, 1789
- triglyceride**, computer, fatty acid ester, gas chromatography, mass spectrometry, phospholipid, 3047
 - serum, lutermethod comparison, automation, 3046
- triiodothyroxine**, electromagnetic radiation, heating, microwave radiation, thyroid gland, thyroxine, dog, 2566
- triploidy**, mathematic genetics, population model, 2770
- tritium**, occupational exposure, personnel radiation monitoring, tritium surface monitor, 1338
- triton x 100**, acetylcholine, cholic acid, cholinergic receptor, model, model evaluation, theatrical aspects, 12

- troponin**, actin, adenosine triphosphatase, model, muscle, myosin, 48
- calcium, glycerol, muscle fiber, psoas muscle, filament overlap, rabbit, 3146
- trunk**, computer assisted tomography, 1000 cases, 2344
- electromagnetic radiation, radiation absorption, 3714
- tube**, airway, flow, lung compliance, lung volume, wave speed limitation, unifying concept, 1713
- atherosclerosis, blood flow, thrombus, bifurcation, particle behavior, 2459
- blood, oxygenation, silastic, complex geometry, helical coil, 629
- blood flow, erythrocyte, oxygen consumption, turbulent flow, 1702
- elasticity, flow, oscillation, collapsible tube, 1705
- flow, human serum albumin i 131, indicator dilution curve, iodine 125, branching network, 1708
- flow model, fluid dynamics, collapsible tube, oscillation, 3544
- gas detection, hot climate, extreme conditions, 2552
- tuberous sclerosis**, computer assisted tomography, skull, 20 children, 3061
- tumor**, abdominal wall, computer assisted tomography, radiotherapy, therapy, whole body radiation, 16 years old girl, 1181
- brain edema, cerebrospinal fluid, electroencephalography, head trauma, hematoma, intracranial hypertension, cat, epidural pressure measurement, 1076
- computer assisted tomography, metrizamide, spinal cord disease, syringomyelia, vertebral canal stenosis, 3 cases, 2357
- tungsten**, microelectrode, microelectrode tip, oxyacetylene torch flame, tip in 5 sec, 998
- tunnel**, antenna, coaxial cable, telemetry, 3220
- turbidimetry**, antigen antibody reaction, automation, immunoassay, 756
- turbulent flow**, mitral valve, human valve, 72
- turnover frame**, spine, spine traction, automotor frame, 35 cases, 1106
- tympenic membrane impedance**, acoustic reflex, hearing, loudness discrimination, 899
- tympometry**, acoustic impedance, mathematic model, acoustic admittance, w notch, 3518
- acoustic reflex, 80 cases, 2985
- stapes reflex, instrument, electrical stimulation, 1504
- tympoplasty**, plastipore, proplast, 864
- tympostomy tube**, otitis media, spoon bobbin drain tube, 1892
- tyndall phenomenon**, anterior eye chamber, photometry, new device, 2555
- ulcer**, artery, atheroma, computer, macroaggregated albumin technetium 99m, technetium 99m, videorecording, dog, 1614
- ultracentrifugation**, lipoprotein, airdriven micro ultracentrifuge, routine determination, 503
- ultrafiltration**, blood, hemodialysis, design analysis, model, 620
- hemodialysis, stainless steel, microcapillary system, 1485
- ultrasonic microscope**, microscopy, resolving power, ultrasonics, 2870
- ultrasonics**, abdomen, echography, heart, image processing, 3773
- acoustic impedance, erythrocyte, kidney, liver, muscle, sound velocity, tissue, viscosity, shear acoustic impedance, 58
- antigen protein, chemical kinetics, enzyme, ribonuclease, ribonucleic acid, ultrasonic cavitation, 203
- arteriography, atherosclerosis, carotid arteriography, doppler ultrasound flow meter, real time ultrasonic imaging system, 3676
- artery, micrometer, artery diameter, transit time system, 2166
- artery wall, doppler ultrasound flow meter, motion parameter, 2063
- a scan, b scan, echooculography, m scan, new device, 2167
- attenuator, echography, automatic gain control, versatile attenuator, 1433
- automation, echocardiography, heart left ventricle, performance, time to voltage analogue, converter, dog, 1455
- biometry, electrooculography, eye, new device, technique, measurement, axial length, 2987
- blood, echography, scattering, sound, 1285
- blood, echography, sound scattering, 2280
- blood clotting, interferometry, 2587
- blood flow, breast cancer, cancer screening, doppler ultrasound flow meter, 3015
- blood flow, digital computer, doppler ultrasound flow meter, information processing, 2755
- blood pressure, carotid artery obstruction, echography, eye pulse, no touch measurements, 1473
- blood pressure, echography, gas bubble, heart ventricle pressure, noninvasive measurement, 1471
- bone, osteotomy, sawing, welding, surgery, autopsy, rabbits, 1018
- bone piezoelectric potential, ceramics, cortical bone, dielectric constant, silicon dioxide, titanitic acid, human, 75
- brain, skull, transmission ultrasound, thermal lesion, 2164
- brain death, cancer, cerebrovascular disease, echoencephalography, echography, echotomography, survey,

- bruising, radiotherapy, guinea pig, 3785
- b scan, echography, speckle, 3678
- b scan, echography, grey scale, 2276
- calorimetry, computer assisted tomography, dosimetry, echography, megahertz frequency, 1197
- cardiography, echocardiography, echography, image processing, real time conversion, 1052
- cavitation, cell, yeast, yeast cell, mechanism, 1021
- cell death, elodea leaf, 2165
- congenital malformation, fetus heart rate, mouse, 2573
- coronary artery, doppler ultrasound flow meter, heart surgery, localization of coronary artery, 3689
- correlation function, echography, laser, light reflection, 127
- decompression, doppler ultrasound flow meter, spectrometry, decompression data, 1022
- doppler ultrasound flow meter, heart valve disease, 2926
- doppler ultrasound flow meter, spectrometry, spectrum broadening, 2283
- echocardiography, mitral valve prosthesis, mitral valve stenosis, model, three different mitral valve models, 427
- echocardiography, echography, image processing, digital image focusing, 1026
- echocardiography, multitransducer scanner, 3263
- echography, echo structure, 1025
- echography, image processing, 2660
- echography, heart muscle, sound attenuation, 2656
- echography, bragg diffraction scanner, 602
- echography, radiation scattering, 731
- echography, spleen, 2673
- echography, model, tissue model, liquid mixture with acoustic characteristics, 738
- echography, image processing, acousto electronic lens, 2269
- echography, radiotherapy, review, 2267
- echography, image processing, 1914
- echography, moving target, 2282
- echography, image processing, transducer array, 3784
- endoprosthesis, metal prosthesis, temperature, rabbit, 191
- fiberoscope, microphone, 2574
- image processing, detector array, review, 2270
- kidney, liver, radiation hazard, testis, rabbit, 1828
- laser, microphone, non linear acoustics, 601
- microscopy, resolving power, ultrasonic microscope, 2870
- microscopy, radiation hazard, 299
- radiation hazard, usa regulations, 1824
- spectrometry, 196
- ultrasonic transducer**, cardiography, echography, kinetocardiography, 2284
- echography, electromyography, speech, new transducer, 3236
- echooculography, eye movement, movement recording, 1804
- ultraviolet microscopy**, polarization microscopy, determination of optical parameters, 2556
- ultraviolet radiation**, beta radiation, image sensor, ion radiation, microchannel plate, 1533
- catalase, escherichia coli, respiration, superoxide dismutase, continuous flow system, 1344
- cell membrane, cell membrane potential, ion exchange, spiropyran, photovoltaic cell, photochromism, 1007
- digital computer, spectrometry, electron emission, 1559
- erythema, erythropoietic porphyria, light reactivity, minimum erythema dose, photochemotherapy, phototest, new apparatus, application, 3651
- ionization meter, photometry, synchrotron, ionization chamber, 1009
- laser, monochromator, 2145
- light, 2562
- light, retinula cell, fly, retinula, 1514
- light, light modulator, 3652
- light, spectrometry, fourier transform, 3644
- lipid membrane, membrane permeability, mitochondria membrane, 1625
- mica, vacuum, window, mica window, optic cell, 1412
- optic filter, liquid filter, 1411
- photometry, argon arc standard, 1413
- university**, accident prevention, college, education, safety, curriculum, safety professional, model, 1830
- uranium**, ionizing radiation, linear accelerator, radiation protection, 2667
- uranium dioxide u 235**, autoradiography, lung, neutron induced autoradiography, rat, 3255
- uranium mine**, environmental monitoring, radioactive contamination, water system, uranium milling, new mexico, 1336

urea, aminoacid, chromatography, electrophoresis, skin, thin layer chromatography, method, device, 3746

- cerebrospinal fluid pressure, hemodialysis, kidney failure, mathematic model, treatment guideline, 477
- computer model, countercurrent multiplier system, kidney tubule absorption, mathematic model, sodium, transient simulation, steady state simulation, 473
- diuresis, henle loop, hydropenia, kidney medulla, kidney tubule, mathematic model, human kidney, 2460

urea blood level, compartment model, creatinine blood level, hemodialysis, mathematic model, peritoneal dialysis, uremia, 3169

uremia, compartment model, creatinine blood level, hemodialysis, mathematic model, peritoneal dialysis, urea blood level, 3169

ureter, computer assisted tomography, esophagus, 200 cases, 3844

- prosthesis, urinary tract, review, 2615

ureter stone, stone basket, 40-60 h2, vibrating basket, dogs and patients, 1068

urethan, angiography, cast, elasticity, heart left ventricle, heart muscle, mathematic model, calculation of young's elastic modulus, 433

urethra, bladder, bladder pacemaker, electrode, implant, micturition, paraplegia, quadriplegia, spinal cord injury, baboon, 1486

- catheter withdrawal machine, pressure profile, 2220

urethra obstruction, bladder sphincter, prosthesis, urine incontinence, implantable hydraulic system, 2222

urethra pressure, bladder pressure, micturition, experimental model, 2616

- bladder sphincter, electrostimulation, stress incontinence, urine incontinence, 40 patients, 664

urethra urine flow, elasticity, mathematic model, female urethra, 925

urinalysis, urine sampling, urine sediment, 235

urinary tract, flow, mathematic model, thermodynamics, parallel flow tube, 2061

- prosthesis, ureter, review, 2615

urine incontinence, bladder pacemaker, hydrolic device, 3718

- bladder pacemaker, electrostimulation, 2958
- bladder sphincter, prosthesis, urethra obstruction, implantable hydraulic system, 2222
- bladder sphincter, electrostimulation, stress incontinence, urethra pressure, 40 patients, 664
- artificial sphincter, implantable device for male, 237

urine sampling, urinalysis, urine sediment, 235

- 24 hour urine fractionator, 236

urine sediment, urinalysis, urine sampling, 235

urogenital tract, bladder carcinoma, cancer cytodiagnosis, cell dedifferentiation, computer, unsupervised learning algorithms, 1156

- bladder carcinoma, cancer cytodiagnosis, cell dedifferentiation, computer, supervised learning algorithms, classification, 1155

uterine cervix, mathematic model, uterine cervix dilatation, force dilatation, tissue rupture, 1277

uterine cervix carcinoma, abdominal wall, computer assisted tomography, metastasis, radiotherapy, case report, 3812

- cancer cytodiagnosis, computer, microspectrophotometry, uterine cervix cytology, cytologic automation, papanicolaou staining, 109 free lying cells, 332

uterine cervix cytology, cancer cytodiagnosis, computer, microspectrophotometry, uterine cervix carcinoma, cytologic automation, papanicolaou staining, 109 free lying cells, 332

- cell, cytology, fourier transform, image processing, 2511
- cell, cytology, mathematic model, pattern recognition, 2509
- cytology, deoxyribonucleic acid, laser, spectrometry, 2510

uterine cervix dilatation, mathematic model, uterine cervix, force dilatation, tissue rupture, 1277

uterine tube, burn, electric trauma, electrocoagulation, intestine trauma, laparoscopy, uterine tube sterilization, 659

- egg, egg transport, mathematic model, random walk model, 438
- force transducer, implant, muscle contraction, telemetry, monkey, 1770
- hysteroscopy, implantation, occlusion, uterus, steerable hysteroscope, transcervical occlusion, 1067

uterine tube sterilization, burn, electric trauma, electrocoagulation, intestine trauma, laparoscopy, uterine tube, 659

uterus, forceps, laparoscopy, manipulator, sterilization, bipolar principle, 660

- hysteroscopy, implantation, occlusion, uterine tube, steerable hysteroscope, transcervical occlusion, 1067

uterus contraction, fetus, hypoxia, mathematic model, oxygen consumption, placenta, 205

- labor, impedance measurement, 30 cases, patient comfort, 2614

utricle, hydrodynamics, mathematic model, semicircular canal, fluid flow, 440

u wave, computer, vectorcardiography, 108 cases, u vector, summation by computer, 2320

vaccination, epidemic, inactivated virus vaccine, influenza a, influenza virus a, mathematic model, stochastic model, 3499

vacuum, electric field, oil mist, mist precipitator, 153
 - hydrogen discharge, lamp, monochromator, 1817
 - infrared radiation, light, window, 3657
 - manometry, thermistor, pirani gauge, 3620
 - mica, ultraviolet radiation, window, mica window, optic cell, 1412
vacuum aspiration, abortion, plastic, metal versus plastic cannulae, 234
vacuum pump, cooling system, monitoring, 994
vagina, cassette recorder, electrocardiography, electroencephalography, physiology, plethysmography, sexual arousal, sexuality, vaginal photoplethysmography, cassette recorder, 1883
vagus nerve, breathing, mathematic model, nerve conduction, rhythmogenesis, lotka volterra model, 467
 - electroencephalography, evoked cortical response, nerve stimulation, cat, 2972
 - evoked cortical response, orbital cortex, splanchnic nerve, tibial nerve, nerve stimulation, cat, 2973
valinomycin, lecithin, lipid membrane, membrane steady potential, monazomycin, nonactin, phosphatidylethanolamine, phospholipid, antibiotic membrane probe, 1247
value, cancerogenesis, computer program, dose response, nuclear radiation, radiotherapy, 2331
valve, assisted circulation, dura mater, heart left ventricle, biolized intrathoracic device, 2188
van der waals force, cell adhesion, cell contact inhibition, cell fusion, mathematic model, metastasis, 1263
 - cell adhesion, biophysics, 2468
 - lipid membrane, bilayer membrane, 1276
variance analysis, model, statistics, 2775
varicap, electrometer, electronic switch, 3579
varicocele, doppler ultrasound flow meter, stethoscope, doppler stethoscope, value, 1449
varus knee, arthrosis, knee, movement, varus stress, 3517
vascular bed, blood flow, indicator dilution curve, mathematic model, 1715
vascular surgery, experimental animal, microphotography, microsurgery, surgical microscope, 2 separately operated microscopes, foot pedal operated zoom, human surgery, adaptation possible, 327
vasodilatation, adenylcyclase, computer model, cyclic amp, heart muscle ischemia, hypoxanthine, inosine, noradrenalin, phosphodiesterase, rat, 2452
 - blood vessel resistance, muscle blood flow, papaverine, sympathectomy, rate sensitivity regulation, cat, 645
vasopressin, aldosterone, angiotensin, blood volume, computer model, kidney function, 1311
 - computer model, diuresis, model aspects, 2960
vectorcardiography, algorithm, computer, electrocardiography, mathematic model, qrs complex, wave recognition algorithm, chest, 3180
 - aorta stenosis, aorta valve disease, aorta valve regurgitation, computer, electrocardiography, heart left ventricle hypertrophy, 257 patients, 2323
 - artificial heart pacemaker, computer, pacemaker assessment, 1858
 - averaging, digital computer, electrocardiography, monitoring, 344
 - cardiography, magnetocardiography, 1864
 - color, color vectorcardiogram, direct writing, 2191
 - computer, 3423
 - computer, inheritance, sex chromosome aberration, semiautomatic procedure, 770
 - computer, automatic analysis, 2324
 - computer, 2321
 - computer, u wave, 108 cases, u vector, summation by computer, 2320
 - computer, electrocardiography, impact on cardiologist interpreter of scalar electrocardiogram, 2317
 - data reduction, data transmission, electrocardiography, telemetry, 1773
 - electrocardiography, fetus electrocardiography, information processing, fetus, 2478
vegetation, radioactive contamination, technetium 99m, uptake, soybean and wheat, 941
vehicle, acceleration, vibration, ride comfort, quantification, 2651
vein, artery, aspirator, bubble, bubble removing, 1048
 - artery, blood vessel spasm, vein diameter, angiometer, diameter, a electromagnet, 1840
vein blood flow, aorta flow, capillary flow, circulation, model, 919
 - calf, thrombosis, external pressure, 11 normals, 2202
 - cava vein blood flow, hemodynamics, inferior cava vein, human, 924
vein catheterization, plastic implant, polymer, thrombogenesis, 3286
vein diameter, artery, blood vessel spasm, vein, angiometer, diameter, a electromagnet, 1840
vein occlusion plethysmography, brain blood flow, jugular vein, non invasive measurement, newborn infant, 1861
vein sinus, arteriovenous malformation, cerebellum tentorium, computer assisted tomography, subarachnoid hemorrhage, vein thrombosis, normal ct appearance, nonneoplastic pathology, 1596
vein thrombosis, arteriovenous malformation, cerebellum tentorium, computer assisted tomography, subarachnoid hemorrhage, vein sinus, normal ct appearance, nonneoplastic pathology, 1596
velocity, acceleration, blunt trauma, deceleration, traffic accident, trauma, tolerance to impact acceleration, 2803
velopharyngeal closure, speech, vowel, photoelectric instrument, velography, 2947

- venous blood**, carbon dioxide, estimation, 565
- venous oxygen tension**, arterial carbon dioxide tension, arterial oxygen tension, carbon dioxide electrode, mass spectrometry, oxygen tension electrode, continuous measurement, 3632
- ventilator**, alarm monitoring, artificial ventilation, bennet, 3312
 - anesthesia, artificial ventilation, standard adult equipment, rat, 653
 - anesthesia, artificial ventilation, digital system, digital control, 1547
 - artificial ventilation, spiromat 650 reliability, 321
- verapamil**, calcium channel, heart muscle fiber, procaine, propranolol, sodium channel, cat, 2412
- vertebral artery angiography**, cerebellum hemorrhage, cerebellum infarction, cerebrovascular accident, computer assisted tomography, review, 1191
- vertebral canal**, computer assisted tomography, vertebral canal stenosis, toshiba unit, 3819
- vertebral canal stenosis**, computer assisted tomography, vertebral canal, toshiba unit, 3819
 - computer assisted tomography, metrizamide, spinal cord disease, syringomyelia, tumor, 3 cases, 2357
- vestibular nucleus**, model, optokinetic nystagmus, vestibular nystagmus, 2036
- vestibular nystagmus**, acceleration, computer program, eye, information processing, statistics, velocity, analog processing, cross correlation data analysis, 1497
 - barany test, mathematic model, 1662
 - electronystagmography, microprocessor, optokinetic nystagmus, 2000
 - model, optokinetic nystagmus, vestibular nucleus, 2036
- vestibular system**, angular acceleration, computer model, vestibuloocular reflex, white noise, computer simulation, cross correlation analysis, white noise input, cat, 1286
 - mathematic model, oscillation, rotation, phase characteristic, phase lead, 3133
 - mathematic model, oculomotor nerve, oscillation, vision, visual acuity, control task, performance, 3515
 - pad, semicircular canal, computer, impulse weight function, frog, 3356
- vestibulocochlear nerve**, nerve cell potential, newborn, recording method, rat, 2887
- vestibulocochlear organ**, mathematic model, spike, pigeon, 3198
- vestibulometry**, electronystagmography, laboratory device, 255
- vestibuloocular reflex**, angular acceleration, computer model, vestibular system, white noise, computer simulation, cross correlation analysis, white noise input, cat, 1286
 - electronystagmography, mathematic model, nystagmus, physiological vs pathological conditions, 3135
 - mathematic model, quick phase generation, cat, 3496
- vibration**, acceleration, head movement, intracranial pressure, model, monkey, 3009
 - acceleration, vehicle, ride comfort, quantification, 2651
 - acceleration, human body, model, human body, reaction to external forces, 2677
 - airplane pilot, body posture, hand, head, instrument panel, fighter bomber, lumped parameter biomechanical model, 3366
 - aviation, bone density, helicopter pilot, skeleton, skeletal system, response, 3010
 - behavior, stimulation, pocket sized cueing device, 245
 - digital indicator, monitoring, newborn, rat, 1551
 - displacement, interferometry, laser, vibration measurement, displacement measurement, speckle interferometer, 1432
 - electroglottography, stroboscopy, vocal cord movement, 20 normal persons, 3242
 - heart sound, kinetocardiography, electrooptical scanner, 1047
 - holography, signal noise ratio, vibration analysis, 573
 - mathematic model, stress, visual tracking, whole body vibration, conceptual stress study model, 3141
 - model, sitting human operator, vibroisolation, 2654
 - model, human response modelling, biodynamic measurements, 2428
 - nerve stimulation, powered prosthesis, sensory nerve, tactile discrimination, human, 1902
 - noise reduction, testing damping material, 1027
- vibrator**, audiometry, bone conduction, calibration force level, 2 new vibrators, 3730
- videorecording**, artery, atheroma, computer, macroaggregated albumin technetium 99m, technetium 99m, ulcer, dog, 1614
 - brain depth recording, brain depth stimulation, electrode, electrode location, animal, 3726
 - capillary flow, recording system, 3623
 - computer, macroaggregated albumin technetium 99m, scintiangiocardiography, scintillation camera, 3818
 - computer assisted tomography, fluoroscopy, 1963
 - electroencephalography, electrooculography, epilepsy, sleep, telemetry, automatic analysis, visual analysis, video recording, closed circuit, 1884
 - image processing, basics, videodisc, 2504
 - image processing, 2500
 - indirect ophthalmoscopy, ophthalmoscopy, television, 2253
 - medical education, television, 412
- vidicon**, resolving power, television camera, emr, photoelectric, 3597
 - thermography, 2117

- virus**, attenuated virus, central nervous system, live vaccine, lumbar spine, mathematic model, neurovirulence, poliomyelitis virus, thalamus, virus virulence, neurovirulence assay, monkey, 3492
- virus infection**, cellular immunity, corona virus, immune deficiency, mononuclear granulocyte, mouse hepatitis virus, spleen cell transplantation, thymectomy, T lymphocyte, 3402
- virus virulence**, attenuated virus, central nervous system, live vaccine, lumbar spine, mathematic model, neurovirulence, poliomyelitis virus, thalamus, virus, neurovirulence assay, monkey, 3492
- viscoelasticity**, anisotropy, aorta strip, artery, mathematic model, dog, 1675
 - articular cartilage, cartilage, femur, shear stress, rabbit, 38
 - cartilage, interstitial fluid, non linear interaction, cattle, 39
 - mathematic model, soft tissue, nonlinear system, 3520
 - mathematic model, smooth muscle, 3150
 - skin, ballistometer, 46 normal subjects, 2415
- viscometry**, polymer, automation, capillary viscometer, 1386
 - sample holder, suspension, 553
 - viscosity, 3172
 - rolling ball viscometer, 0.5-10 cp, 156
 - acoustic viscometer, shear viscosity, 155
- viscosity**, acoustic impedance, erythrocyte, kidney, liver, muscle, sound velocity, tissue, ultrasonics, shear acoustic impedance, 58
 - blood viscosity, flow, mathematic model, radial viscosity, 1306
 - cell volume, elasticity, erythrocyte membrane, human, 215
 - elasticity, muscle, resting muscle, frog, 893
 - elasticity, knee, patellofemoral joint, contact study, 1114
 - elasticity, flow, lecithin, mathematic model, shear rate, suspension, 1710
 - viscometry, 3172
- vision**, accident, car driving, eye movement, curve negotiation, 1120
 - acoustic nerve, hearing, mathematic model, photo counter, 3157
 - aerospace medicine, aviation, ophthalmology, visual field, space studying device, flight simulation, 3368
 - air pollution, atmosphere, laser, 1252
 - algorithm, image processing, signal noise ratio, visual resolution, 1925
 - auditory system, hearing, psychophysics, 250
 - band pass filter, information processing, mathematic model, nerve potential, visual stimulation, non linear spatial filter, 912
 - behavior, electromyography, head movement, neck muscle, photography, 2638
 - color vision, visual acuity, 2826
 - color vision, chromatic discrimination, a chromatic discrimination, 1889
 - critical flicker fusion, photostimulation, sinusoidal stimulator, 1105
 - decision, information processing, noise, signal detection, multiple channel, human, 1694
 - depth perception, laser, pupil, 3539
 - digital computer, pattern recognition, 2449
 - digital computer, lateral geniculate body, nerve cell network, visual system, cat, 2380
 - digital computer, image processing, photometry, stereoscopic vision, 3647
 - eye, laser, retina lesion, ocular hazard, monkey, 3637
 - eye movement, feedback system, head movement, mathematic model, eye head coordination, 1669
 - face, recognition, signal detection, 28 volunteers, 3722
 - gas mask, refraction, spectacle glasses, spectacle inserts, 2630
 - hearing, visual feedback, time pattern, grasshopper, 2399
 - illusion, law, perception, mathematic model, stability, 3161
 - image processing, photography, mosaic picture, 1774
 - magnetic field, migration, bird, 166
 - mathematic model, nonlinear system, 2448
 - mathematic model, visual cortex, development, columnar organization, 459
 - mathematic model, oculomotor nerve, oscillation, vestibular system, visual acuity, control task, performance, 3515
 - mathematic model, nonlinear system, spatial perception, 1691
 - mathematic model, pattern recognition, visual adaptation, spatial filtering, local adaptation, 1290
 - mathematic model, lie group, computation, 2825
 - model, pattern recognition, visual acuity, 2049
 - model, movement perception, detection model, 2048
 - myopia, telescope, dioptric setting, light level, 1409
 - optometry, visual stimulation, 3 d visual stimulation, 2499
 - pattern recognition, feature relation, 1689
 - pattern recognition, visual discrimination, form discrimination, 1293
 - photography, stereoscopic vision, angle detection, 2438

- visual acuity, 1690
- visual acuity**, color vision, vision, 2826
 - mathematic model, oculomotor nerve, oscillation, vestibular system, vision, control task, performance, 3515
 - model, pattern recognition, vision, 2049
 - photoreceptor, voltage signal, turtle, 911
 - vision, 1690
- visual adaptation**, mathematic model, pattern recognition, vision, spatial filtering, local adaptation, 1290
 - retina rod outer segment, rhodopsin, simple equivalent, circuit analysis, 3535
- visual aid**, blindness, pattern recognition, touch, 'tactile' vision, 697
 - blindness, laser cane, mobility, electronic aids, sonic guide, children, pathsounder, 1508
 - eye surgery, loupe, low vision, microsurgery, prism, new device, 2295
 - image intensifier, night blindness, retina pigment degeneration, 1516
 - low vision, students' experiences, 690
 - low vision, visual field defect, field expanders, 268
- visual cell**, calcium, illumination, photoreceptor, activity change, cattle, 458
- visual cortex**, brain depth stimulation, brain edema, electrode, electrode impedance, glucocorticosteroid, mannitol, seizure, somatomotor epilepsy, cat, 1489
 - brain depth stimulation, electroencephalography electrode, stimulation threshold, striate cortex, visual prosthesis, macaque monkey, 1072
 - cognition, hemisphere, imagination, nerve cell, nerve cell network, perception, visual nerve cell, model, 86
 - mathematic model, vision, development, columnar organization, 459
 - visual field, visual stimulation, grating, field tuning, cat, 3159
- visual discrimination**, binocular contrast, analyzer, 3534
 - pattern recognition, vision, form discrimination, 1293
- visual distortion**, light, optical lens, displaying distortion, 3639
- visual feedback**, hearing, vision, time pattern, grasshopper, 2399
- visual field**, aerospace medicine, aviation, ophthalmology, vision, space studying device, flight simulation, 3368
 - binocular vision, binocular fixation, testing device, 693
 - color perimetry, perimetry, high luminance, 1896
 - computer, glaucoma, perimetry, 2379
 - electrooculography, static perimetry, automatic perimetry, 1566
 - information processing, luminance, mathematic model, night vision, photoreceptor, 3537
 - lateral geniculate body, mathematic model, nerve cell potential, space time weight function, 3185
 - perimetry, autoplots, instrumentation and technique, 2986
 - perimetry, binocular, 1894
 - visual cortex, visual stimulation, grating, field tuning, cat, 3159
- visual field defect**, brain tomography, computer assisted tomography, meningioma, optic nerve, woman of 44, 1586
 - low vision, visual aid, field expanders, 268
- visual fixation**, new device, 2992
- visual memory**, model, movement perception, forward inhibition, 1636
- visual nerve cell**, cognition, hemisphere, imagination, nerve cell, nerve cell network, perception, visual cortex, model, 86
- visual pigment**, mathematic model, spectral sensitivity, techniques, 1097
- visual prosthesis**, brain depth stimulation, electroencephalography electrode, stimulation threshold, striate cortex, visual cortex, macaque monkey, 1072
- visual stimulation**, band pass filter, information processing, mathematic model, nerve potential, vision, non linear spatial filter, 912
 - body posture, computer, eye movement, stabilography, 275
 - color vision, dyslexia, fading phenomena, 3732
 - optometry, vision, 3 d visual stimulation, 2499
 - visual cortex, visual field, grating, field tuning, cat, 3159
- visual system**, brightness, color vision, mathematic model, brightness generation, 1693
 - collimator, light concentrator, 575
 - color vision, space, human, 266
 - color vision, opposite colour, human, 3538
 - color vision, anticolor, human, 1899
 - color vision, mathematic model, opposite color difference, anticolor, 3160
 - contrast, darkness, light, mathematic model, retina image, human system, 1697
 - digital computer, lateral geniculate body, nerve cell network, vision, cat, 2380
 - image processing, radiography, roentgen radiation, soft roentgen radiation, mirror, 3027
 - infrared radiation, condenser, 3653
- visual tracking**, mathematic model, stress, vibration, whole body vibration, conceptual stress study model, 3141
 - television, wildlife, 995

- vital capacity**, functional residual capacity, lung compliance, pressure volume curve, model, human, 3164
- vitreous body hemorrhage**, echooculography, exophthalmos, melanocytoma, optic nerve coloboma, retinoblastoma, new equipment, manual compound scanning, 1100
- vocal cord**, hearing, spectrometry, speech intelligibility, vowel, voice onset, fundamental frequency, vowel consonant, 259
 - lens, stroboscopy, television, amplitude determination, 3309
 - mathematic model, speech, man, 41
- vocal cord movement**, electroglottography, stroboscopy, vibration, 20 normal persons, 3242
- vocalization**, pattern recognition, automatic recognition, monkey, 1999
- vocal pitch**, correlation function, speech, autocorrelation, 901
 - speech, 2581
- vocal system**, forensic science, frequency analysis, larynx prosthesis, sex identification, speech spectrography, 12 volunteers, experimental study, 3107
 - joint, movement, speech, 1867
 - mathematic model, speech, inverse filtering, 614
 - speech, vowel, tract length control, 2440
 - speech, glottal wave, 2584
- voice**, electric wheelchair, quadriplegia, voice control, 1112
 - frequency meter, spectrometry, speech, fundamental frequency, 612
 - spectrometry, speech, voiced voiceless distinction, 1062
- voice spectrography**, formant, speech, vowel, 3216
- voltage clamp**, acetylcholine, muscle fiber, tissue culture, in vitro, chicken, 92
 - action potential, heart muscle fiber, heart ventricle, mathematic model, 938
 - alamethicin, lipid membrane, membrane potential, multipore system, multi pore system, voltage jump current relaxation measurement, 3174
 - ammonium, membrane potential, sodium chloride, electric resonance, 1720
 - electrode, silver, silver chloride, submaxillary gland, rabbit, 3233
 - information processing, current voltage plotting, 1787
 - lipid membrane, membrane potential, tetraphenylborate sodium, bilayer membrane, 3173
 - mathematic model, membrane potential, jump and continuous description, 481
 - membrane, membrane potential, non uniform membrane, 482
- voltage divider**, attenuator, induction, low frequency divider, 954
- voltage frequency converter**, bioenergy, galvanic current, power supply, rat, dog, rabbit, 928
 - frequency modulation, generator, telemetry, voltage controlled oscillator, 549
- voltage stabilizer**, electron microscopy, power supply, voltmeter, 981
- voltmeter**, diode, display system, light, led array, 956
 - electron microscopy, power supply, voltage stabilizer, 981
 - dc meter, squid, low dc voltages, 1353
 - 1766
- volume**, electrocardiography, monitory, pulse, skin conductance, transducer, multifunction transducer, 1142
 - plethysmography, pressure, pressure transducer, temperature, thermal problems, 949
- volume conductor**, electric field, frequency analysis, mathematic model, nerve fiber membrane potential, 932
 - mathematic model, nerve conduction, nerve potential, 1739
- voluntary movement**, mathematic model, movement, muscle contraction, optimal voluntary control, 1659
- von hippel lindau disease**, cerebellum, computer assisted tomography, hemangioblastoma, spinal cord, case report, 3073
- vowel**, computer program, hearing, speech intelligibility, speech synthesis, 1030
 - consonant, hearing, information science, intelligibility, speech synthesizer, phoneme boundary effect, voice onset time, 57
 - echography, speech, vowel tenseness, 2908
 - formant, speech, voice spectrography, 3216
 - hearing, spectrometry, speech intelligibility, vocal cord, voice onset, fundamental frequency, vowel consonant, 259
 - hearing, speech, speech intelligibility, l,r context, 54
 - speech, vocal system, tract length control, 2440
 - speech, child, 2585
 - speech, velopharyngeal closure, photoelectric instrument, velograph, 2947
- walker carcinoma**, cancer chemotherapy, cancer graft, cancer growth, carcinomatous meningitis, rat model, histopathology, screening of antineoplastic agents, 398
- walking**, body temperature, circadian rhythm, computer, confinement, heart rate, sheep, 847
 - computer model, coordination, leg movement, insect, 1278
 - electroencephalography, joint, mathematic model, movement, automatic calculation method, human, 445

- energy, muscle performance, running, work, level walking, 1121
- gait, speed measurement, 1115
- gait, leg brace, oxygen consumption, rehabilitation, spinal cord injury, spinal cord transverse lesion, 3 cases, pneumatic orthosis, 289
- walking aid**, gait, sex, sex recognition, dynamic point light display, human, 1901
 - physical disability, automatic elevator, 3360
- war**, disaster, monitoring, stethoscope, trauma, 1141
- warfarin**, bile, bromsulfophthalein, computer model, drug interaction, pharmacokinetics, 3498
- washout curve**, computer, lung, lung disease, mathematic model, scintillation camera, xenon 133, and normals, 380
- waste water**, environment, water pollution, instrumentation, reliability, 2169
- water**, blood pressure, blood vessel resistance, kidney failure, mathematic model, renovascular hypertension, sodium, 2420
 - carbon dioxide, gas analysis, lung closing volume, lung function test, acoustic analyzer, 2218
 - computer model, digital computer, diuresis, kidney tubule absorption, sodium, sodium depletion, 478
 - lens, measurement, instrumentation, 169
- water cooling**, protective clothing, skin temperature, thermoregulation, water perfused suit, 1440
- water loss**, carbon dioxide, evaporation, oxygen consumption, respiration quotient, water loss measurement, bird, lizard, 206
 - evaporation, hygrometer, dew point hygrometry, pigeon, 2174
 - heat loss, model, respiration, predictive model, kangaroo rat, 1279
- water pollution**, computer, drinking water, mass spectrometry, organic compound, surface water, united states, trace analysis, 3796
 - environment, waste water, instrumentation, reliability, 2169
 - environment, instrumentation review, 3267
 - environment, telemetry, water depth, bottom feature, 2494
 - environment, oxygen, 1652
 - environmental monitoring, liquid chromatography, water quality, 1028
- water quality**, environment, recording, thermistor, thermometer, 1799
 - environmental monitoring, liquid chromatography, water pollution, 1028
- water system**, environmental monitoring, radioactive contamination, uranium mine, uranium milling, new mexico, 1336
- water treatment**, automation, medical instrumentation, sewage treatment, netherlands, 3208
- water vapor**, gas diffusion, gas mixing, helium, nitrogen, oxygen, binary and ternary diffusion, 1295
- wave**, electroencephalography, evoked response, signal processing, spectrometry, 1740
- wave analyzer**, electromagnetic radiation, spectrometry, 3580
- waveform generator**, electrostimulator, trapezoid generator, 2489
- waveguide**, light modulator, switch, 3243
- weapon**, blood stain, clothing, forensic medicine, isoenzyme, lactate dehydrogenase, soil, species origin, 3276
 - mathematic model, population model, arms race, 2784
- wedge filter**, angiography, contrast intensification, 3024
- weight bearing**, above knee amputation, below knee amputation, immediate prosthesis, load cell, 1118
 - leg, orthosis, splint, 1320 mechanics, 3001
- weightlessness**, bone stress, centrifuge, femur, gravitational stress, 3g mouse, 2647
- welding**, bone, osteotomy, sawing, ultrasonics, surgery, autopsy, rabbits, 1018
- wheatstone bridge**, skin conductance, 4 electrode methods, resistance measurement, 1392
- wheelchair**, body cast, orthopedics, prosthesis, seat, body cast vacuum form method, 280
 - mental deficiency, physical disability, prescription, 286
 - digital control, 708
- white noise**, angular acceleration, computer model, vestibular system, vestibuloocular reflex, computer simulation, cross correlation analysis, white noise input, cat, 1286
 - hodgkin huxley equation, nerve fiber, nerve fiber membrane potential, synapse, squid, 933
- whole body counter**, body burden, whole body analysis, 3392
 - intestine absorption, liquid scintillation, potassium, whole body potassium, description of counter, clinical application, 595
 - gamma radiation, hamburg counter, updating, 302
- whole body potassium**, intestine absorption, liquid scintillation, potassium, whole body counter, description of counter, clinical application, 595
- whole body radiation**, abdominal wall, computer assisted tomography, radiotherapy, therapy, tumor, 16 years old girl, 1181
 - alkaline phosphatase isoenzyme, bone, intestine, radiation injury, biologic dosimetry, rat, 1162
 - s (2 aminoethyl) isothiuronium, lifespan, mortality, radiation dose fractionation, mouse, 2903
- whole body radiotherapy**, betatron, megavoltage radiotherapy, arc therapy, 2666
- whole body scanning**, cancer, computer assisted tomography, radiotherapy, treatment planning, follow up, 167

- cases, 2345
- wildlife**, television, visual tracking, 995
- willebrand disease**, cell aggregation, glanzmann disease, staphylococcus aureus, thrombocyte aggregation, measurement device, 3283
- window**, infrared radiation, light, vacuum, 3657
 - mica, ultraviolet radiation, vacuum, mica window, optic cell, 1412
 - model, scintillation camera, effect window fraction, deadtime correction, 1424
- window discriminator**, action potential, histogram, microelectrode, time amplitude discriminator, 2238
- wire fixation**, poly(methacrylic acid methyl ester), stainless steel, tensile strength, 1526
- wolff parkinson white syndrome**, computer, heart ventricle activation, computer simulation, 2697
- work**, athlete, model, running, negative work, running speed, 6 athletes, 3516
 - energy, muscle performance, running, walking, level walking, 1121
- work environment**, bioengineering, ergonomics, industry, occupational health, manual labor, uk, overview, 2653
- worker**, drowsiness, electricity, excitability, fatigue, headache, nausea, high voltage field, environmental effects, 3106
- workload**, biomechanics, intervertebral disk, mathematic model, spine, systems identification scheme, linear viscoelastic properties, 3140
 - breathing rate, electrocardiography, heart rate, lung ventilation, sailor, ship, skin temperature, telemetry, seagoing ship, 524
- workroom air**, air, environmental monitoring, occupational exposure, radioactive contamination, radon 222 daughter, working level, 2904
 - air pollution, anesthetic gas, automotive exhaust, operating room, scavenging system, 1932
- wound healing**, artifact, electrocardiography, electroencephalography, model, skin abrasion, skin dystrophy, skin injury, skin potential, sweating, transcutaneous stimulation, 3234
 - laser, tensile strength, rat, 2031
- wound infection**, abdominal surgery, 30 patients, treatment, closed system surgical isolator, 3790
- writing**, computer program, drug prescription, writing assistance, 2296

- X chromosome recessive inheritance**, brain atrophy, brain scintigraphy, computer assisted tomography, melanodermic leukodystrophy, 2 cases, 3816
- xenon**, brain blood flow, computer assisted tomography, contrast medium, phantom study, monkey, 789
 - brain blood flow, computer assisted tomography, contrast intensification, baboon, 3461
 - bronchography, computer assisted tomography, contrast medium, krypton, lung ventilation, phantom study, 790
 - computer assisted tomography, ionization chamber, radiation detection, roentgen radiation, fan beam computed scanner, 3810
 - freon, krypton, freon 13 b1, gas mixture, 68
- xenon 127**, transfer, unit dose packaging, 3670
- xenon 133**, althesin, brain blood flow, brain ischemia, brain scintigraphy, computer assisted tomography, 158 cases, 2730
 - aqueous humor, intraocular pressure, minicomputer, ophthalmology, pdp 8 e, cat, 3481
 - argon 37, breath analysis, calcium, recirculating breath collection system. effect on exhalation rate, 3640
 - bladder wall permeability, epithelium, skin permeability, in vitro, water boundary layer, frog, 2012
 - brain blood flow, cerebrovascular disease, computer, computer program, multiexponential curve fitting, 3482
 - brain blood flow, compartment model, computer, information processing, one line, 852
 - brain blood flow, brain blood volume, brain infarction, brain scintigraphy, brain tumor, carotid artery obstruction, technetium 99m, transient ischemic attack, 43 cases, 2206
 - brain blood flow, computer assisted tomography, medial brain artery occlusion, monkey model, 1584
 - brain blood flow, brain cortex, woman of 40, sequential analysis, 3699
 - brain blood flow, computer, scintillation camera, methods, 3063
 - brain blood flow, brain cortex, consciousness, frontal lobe, schizophrenia, review, 49 references, 1074
 - computer, lung, lung disease, mathematic model, scintillation camera, washout curve, and normals, 380
 - computer assisted tomography, subdural hematoma, contrast enhancement, case report, man of 54, 3052
 - trapping, reuse system, 3199
- xeroradiography**, modulation transfer function, 3227
 - physical basis, 3021
- x ray film**, angiography, computer, image processing, system, 3840
 - dosimetry, heavy particle radiation, ionization chamber, thermoluminescence dosimeter, radiation activation detector, radiobiological experiment, 1342
 - radiation energy, roentgen screen, screen film system speed, 2251

yeast, cavitation, cell, ultrasonics, yeast cell, mechanism, 1021
yeast cell, cavitation, cell, ultrasonics, yeast, mechanism, 1021

zeitgeber, circadian rhythm, generator, 2 coupled oscillator, 2967

zinc, body burden, dosimetry, prostate scintiscanning, zinc 69m, permissible body burden, 940

- brain, brain cortex, copper, electromagnetic radiation, hypothalamus, iron, magnesium, potassium, sodium, 1600 mhz, rat, 2564

zinc 65, SEE zinc

zinc 69m, body burden, dosimetry, prostate scintiscanning, zinc, permissible body burden, 940

zinc sulfide, gamma radiation, scintillator, fast decay, 1821

AUTHOR INDEX

(figures refer to item numbers)

- | | | |
|----------------------|-----------------------|------------------------|
| 3440 Aas M. | 1165 Aihara T. | 2109 Allen K.L. |
| 2793 Abbott W.M. | 3441 Aii H. | 3852 Allen L.P. |
| 3565 Abdelkerim A.E. | 3066 Aita J.F. | 1210 Allen M.B. Jr. |
| 3092 Abe H. | 3828 Aita J.F. | 3342 Allen M.J. |
| 2477 Abel L.A. | 389 Ait'yan S.Kh. | 516 Allen P.E. |
| 2083 Abeles M. | 481 Ait'yan S.Kh. | 568 Allen R.D. |
| 3056 Abelmann W.H. | 482 Ait'yan S.Kh. | 2579 Allen S.J. |
| 3761 Abou Mandour M. | 1007 Aizawa M. | 205 Allen W.W. |
| 2220 Abrams P.H. | 3156 Aizawa M. | 2663 Almond P.R. |
| 3266 Abramson A.L. | 282 Akeson W.H. | 763 Alperovitch A. |
| 3666 Abrath F.G. | 886 Akeson W.H. | 2600 Alpert N.R. |
| 2221 Acconcia A. | 2936 Akhilesvari C. | 1006 Alsins J. |
| 3596 Achatz M. | 1041 Akhtar M. | 96 Alsmiller R.G. Jr. |
| 3201 Achlama A.M. | 2388 Akiyama T. | 1933 Altemeyer K.H. |
| 1631 Achs M.J. | 2810 Akkas N. | 2338 Altemus L.R. |
| 2170 Achs M.J. | 1853 Akutsu T. | 2823 Altes R.A. |
| 3113 Ackerman E. | 565 Al Dulymi R. | 3155 Altes R.A. |
| 3499 Ackerman E. | 431 Al Janabi N. | 382 Altman B.J. |
| 798 Ackerman L.V. | 1024 Alais P. | 1477 Altman D.G. |
| 805 Ackerman L.V. | 1758 Albarda S. | 3484 Altman H. |
| 523 Ackmann J.J. | 3732 Albee J.L. | 1284 Altman J.A. |
| 779 Ackmann J.J. | 3732 Albee P.R. | 283 Altmeyer G. |
| 608 Acock B. | 3682 Alberghina L. | 1990 Altobelli S.A. |
| 842 Acosta P. | 1699 Albers C. | 2052 Altose M.D. |
| 3033 Adam A. | 1136 Albert C.A. | 2471 Alvarez O. |
| 1330 Adam L.J. | 1042 Albert D.J. | 1725 Amari S. |
| 3144 Adams D. | 2420 Albertin A. | 2475 Amari S. |
| 1753 Adams J.M. | 1948 Albrecht V. | 930 Amari S.I. |
| 2954 Adams J.M. | 2229 Albrecht V. | 2679 Ammar-Khodja |
| 2924 Adams R.B. | 1996 Albright J.P. | 3431 Amois H.I. |
| 1482 Adamson H.P. | 3645 Alchalaby K. | 2662 Amols H.I. |
| 1 Adby P.R. | 1194 Alderson P.O. | 721 Amplatz K. |
| 244 Addis J.W. | 2792 Aldridge J.A. | 2669 Amplatz K. |
| 719 Addison S.J. | 45 Aleinikova K.S. | 769 Amsler L.C. |
| 1416 Adduci D.J. | 2806 Alesso H.P. | 316 Amtey S.R. |
| 102 Adler G.R. | 3494 Alexander B.K. | 1765 Ananda Mohan P.V. |
| 515 Ae T. | 679 Alexander E. Jr. | 1902 Anani A.B. |
| 2143 Afromowitz M.A. | 2252 Alexander G. | 1947 Ancoli S. |
| 1810 Afsar M.N. | 1445 Alexander H. | 976 Andermann F. |
| 1816 Afsar M.N. | 1910 Alexander H. | 3326 Anders D. |
| 895 Agarwal G.C. | 2414 Alexander H. | 622 Andersen L.H. |
| 189 Agarwal G.P. | 359 Alfidi R. | 2920 Andersen L.H. |
| 3514 Agarwal R.C. | 354 Alfidi R.J. | 2472 Andersen O.S. |
| 744 Agarwal S.K. | 827 Alfidi R.J. | 2381 Anderson D.E. |
| 3627 Aggarwal J.K. | 1175 Alfidi R.J. | 3122 Anderson D.E. |
| 1540 Aggarwal R.K. | 2743 Alfidi R.J. | 1418 Anderson D.W. |
| 378 Aggarwal V. | 3429 Alfidi R.J. | 3668 Anderson D.W. |
| 1806 Aghajanian G.K. | 3448 Alfidi R.J. | 3001 Anderson E.G. |
| 1584 Agress H. Jr. | 3606 Alford E.C. | 3420 Anderson J.A. |
| 1060 Ahnefeld F.W. | 324 Ali M.M. | 1720 Anderson J.E. |
| 1811 Ahnefeld F.W. | 1555 Allaire P.E. | 1782 Anderson K.E. |
| 3569 Ahnefeld F.W. | 2035 Allaire P.E. | 1263 Anderson M. |
| 3029 Ahnfeld F.W. | 3649 Allamandola L.J. | 2181 Anderson P.C. |
| 2206 Ahonen A. | 175 Allan J.R. | 3828 Anderson R.E. |
| 2430 Ahsan M.A. | 59 Allen J.B. | 3713 Anderson S.T. |
| 2821 Ahuja A.S. | 701 Allen J.B. | 3822 Anderson T. |
| 2728 Aichinger H. | 1647 Allen J.B. | 3008 Anderson W.R. |
| 1005 Aickin C.C. | 2439 Allen J.B. | 3009 Anderson W.R. |
| 1428 Aickin D.R. | 2819 Allen J.B. | 3500 Andersson R. |

- 3743 Andreeff I.
2481 Andrew E.R.
130 Andrews H.C.
309 Andrews H.C.
366 Andrews H.C.
3663 Andrews J.R.
1115 Andriacchi T.P.
1734 Andrietti F.
473 Ang P.G.P.
3036 Angelillo J.C.
2926 Angelsen B.A.J.
190 Anger H.O.
2310 Angerstein W.
3261 Angevine O.L.
2368 Angle H.V.
3050 Angle H.V.
356 Anliker M.
2563 Anna O.
3245 Annable R.V.
1753 Anne A.
944 Anninos P.A.
594 Annis M.
1679 Antonets V.A.
3526 Antonets V.A.
2595 Antonioli E.G.
2605 Antonioli G.E.
3655 Atoon M.K.
2609 Aoki N.
3027 Aoki S.
745 Aoyagi M.
2897 Apfelberg D.B.
948 Aporta J.
1871 Appel E.
3739 Apsey R.S.
666 Apuzzo M.L.J.
152 Araki N.
2023 Arazi B.
590 Archambeau J.O.
3251 Archambeau J.O.
2244 Ariel M.
2620 Ariel M.
2700 Ariet M.
572 Arizumi T.
1561 Arkin C.F.
78 Arleevskii I.P.
2185 Armah I.B.
1998 Armington J.C.
1566 Armon H.
1786 Armstrong C.M.
1169 Armstrong James M.
403 Armstrong R.L.
242 Arnett D.W.
1837 Arnold G.
1181 Arnold J.
191 Arnold W.
2758 Arnolds D.E.A.T.
1570 Arntz A.
3053 Aroesty J.
452 Aronow H.
2533 Aronsen K.F.
1270 Aronsson H.
1996 Arora J.
857 Arrigo A.
3427 Arrigo A.
2709 Arvidsson A.
2710 Arvidsson A.
3138 Arvikar R.J.
1891 Ary J.P.
3492 Arya S.C.
561 Asari M.
1696 Ascoli C.
667 Asdourian D.
153 Ash W.
425 Ashman W.P.
3724 Ashworth B.
2534 Ashworth T.
2699 Askenazi J.
143 Askgaard B.
535 Askins B.S.
3391 Askins B.S.
34 Asmussen M.A.
3109 Aspin N.
3650 Aspnes D.E.
2691 Assicot M.
3405 Assicot M.
3116 Ataulakhanov F.I.
3045 Atkins G.L.
3217 Atkinson J.E.
892 Atkinson P.J.
1753 Attinger E.O.
2451 Attinger E.O.
2954 Attinger E.O.
2954 Attinger F.M.
2451 Attinger F.M.L.
596 Attix F.H.
3257 Attix F.H.
3054 Attuel P.
1236 Au A.D.
1745 Auerbach V.H.
1945 Auerbach V.H.
596 August L.S.
3257 August L.S.
1797 Augustus J.
3233 Augustus J.
817 Aulich A.
3814 Aulich A.
567 Aulich H.A.
1950 Aunon J.I.
3325 Aunon J.I.
2692 Auslander D.M.
3058 Auth D.C.
192 Auyer S.E.
1427 Auyer S.E.
3210 Auzanneau M.
2259 Avery W.H. Jr.
3332 Avitable M.J.
2812 Avula X.J.R.
2490 Awad S.S.
2662 Awschalom M.
757 Axelbaum S.P.
1208 Axelsson B.
2945 Axen K.
2731 Azar Kia B.
3845 Azar-Kia B.
842 Azen C.
3646 Azzam R.M.A.
2956 Baak J.P.A.
1133 Baard W.P.
1127 Baarli J.
2031 Babayan R.
2169 Babcock R.H.
1327 Babloyantz A.
1584 Bacharach S.L.
339 Bachev S.
795 Bachman D.S.
3435 Bachur N.R.
2454 Back L.D.
2038 Back L.H.
3453 Backlund E.O.
1606 Bacon K.T.
198 Badner B.
1347 Baer N.W.
808 Baert A.L.
820 Baert A.L.
824 Baert A.L.
3149 Baessler U.
3744 Bagby G.W.
2595 Baggioni F.G.
2605 Baggioni G.F.
1131 Bagne F.
2595 Bagni B.
1305 Bagshaw R.J.
3359 Bahaud J.
3589 Baig W.G.
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776 Baillon J.F.
777 Baillon J.F.
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3281 Bain W.H.
1839 Bainbridge D.R.
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2793 Baird R.N.
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2736 Bakay L.
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51 Baker R.W.
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3314 Bakketeig L.
1315 Balanter B.I.
1422 Balasubrahmanyam V.
2085 Balasubramanian R.
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1179 Baleriaux Waha D.

- 3073 Baleriaux-Waha D.
649 Balieu E.
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558 Ballard S.G.
2649 Ballo J.M.
897 Balmer R.T.
3688 Balogh D.
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2093 Bance D.A.
2094 Bance D.A.
44 Band W.
3603 Bandyopadhyay A.K.
1260 Bandyopadhyay R.
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1094 Banko W.
1096 Banko W.
2642 Bar A.
123 Bar Ness Y.
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2687 Barber B.
1557 Barber J.H.
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403 Barber T.
1696 Barbi M.
3437 Barbina V.
2826 Barca L.
1317 Barchi R.L.
413 Bardsley W.G.
124 Barichello G.
96 Barish J.
68 Barish R.J.
2359 Barish R.J.
1226 Barkman B.
190 Barnes B.D.
655 Barnes C.W.
2094 Barnes D.W.H.
1833 Barnes F.S.
3515 Barnes G.R.
3017 Barnes G.T.
3374 Barnes G.T.
747 Barnes P.
323 Barnes P.K.
2282 Barnes R.W.
2682 Barnett G.O.
1169 Barnett T.
1394 Barnikol W.K.R.
3751 Barnum D.T.
399 Barnwell G.M.
2195 Barold S.S.
123 Baron R.
1616 Barquest J.M.
997 Barr L.
1314 Barr R.C.
779 Barr R.E.
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985 Barrault M.R.
1217 Barrett H.H.
1338 Barry P.E.
1719 Barry P.H.
2590 Barry W.H.
598 Barschall H.H.
2899 Barschall H.H.
1155 Bartels P.H.
1156 Bartels P.H.
3704 Barthelemy R.
1072 Bartlett J.R.
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128 Bartolini R.A.
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1258 Bartoszynski R.
2861 Baruah K.C.
1852 Baseliust L.
2182 Bashorun O.A.
10 Baskin R.J.
177 Baskin R.J.
2373 Baskin R.J.
3165 Bass L.
1594 Bassano D.A.
580 Bassen H.I.
2005 Bassingthwaighte J.B.
2929 Bassingthwaighte J.B.
2196 Bassir R.
2703 Batchlor C.D.
3170 Bate H.
154 Bates C.J.
690 Bates S.S.
1396 Batkin S.
183 Batt R.J.
161 Battaglia A.
471 Batten J.R.
1969 Battison T.
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3383 Battista J.J.
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1488 Bauer P.
2765 Bauer P.
147 Bauer R.D.
3675 Baum J.W.
1339 Bauman A.
3839 Bauman R.A.
85 Baumann C.
2643 Baumann F.
843 Baumann J.U.
1339 Baumstark M.
1695 Baures P.Y.
629 Baurmeister U.
1 Baxter J.R.
706 Bayer H.
1563 Bayley R.
3284 Beall A.C. Jr.
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1890 Beard R.B.
559 Beatty P.G.
1464 Beazell J.
199 Beck W.C.
2778 Becker A.
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3726 Beeman F.J.
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1053 Beer P.
1937 Beerman T.H.
3582 Beerwinkle K.
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3621 Beg S.
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262 Behar A.
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3358 Beierlein H.R.
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497 Bekier A.
1216 Bekier A.
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673 Beks W.F.
416 Belanger P.R.
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2528 Bellanger M.G.
3519 Bellet D.
1393 Bellinger M.R.
2223 Bello P.
2425 Belytschko T.
2618 Ben Shakh G.
861 Ben Zvi S.
3608 Ben-Yaakov S.
740 Bendick P.J.
2283 Bendick P.J.
3218 Bendow B.
566 Benes P.
332 Bengtsson E.
2298 Bengtsson E.
874 Benham C.J.
3707 Benink R.J.
1444 Benmair Y.
707 Benner J.
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3583 Bennett E.L.
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862 Bennett H.S.
539 Bennett R.R.
1782 Benoit H.J.
778 Benoit O.
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570 Bentley S.A.
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806 Bentson J.R.
3547 Benz R.
3130 Berakha R.Ya.
1942 Berbari E.J.
2137 Berberian J.G.
2967 Berde C.
2009 Berg H.C.

- 1102 Berg M.
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 1607 Berger W.
 256 Berglund B.
 256 Berglund U.
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 3314 Bergsjo P.
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 804 Bergstrom M.
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 3634 Berkenbosch A.
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 2819 Berkley D.A.
 940 Berkley L.W.
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 2074 Bernard P.
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 2376 Bernard T.E.
 2888 Bernardi L.
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 1226 Bernier Bonneville L.
 66 Berns M.W.
 1147 Bernstein F.C.
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 2703 Berson A.S.
 2620 Berson E.L.
 2343 Bertinchamps A.
 2166 Bertram C.D.
 1225 Bertram G.
 1978 Bertram U.
 3033 Bertrand D.
 856 Bertrand G.
 1944 Bertrand M.
 3521 Bertuzzi A.
 1280 Besserlich H.
 1651 Bettencourt V.M. Jr.
 3398 Beyer C.K.
 968 Beyer J.B.
 1786 Bezanilla F.
 78 Bezuglov V.K.
 3714 Bhag S. Guru
 2158 Bhatt R.C.
 1155 Bibbo M.
 2906 Bichsel H.
 776 Bienenfeld G.
 261 Bienvenue G.R.
 1212 Bierny J.P.
 2295 Biessels W.J.
 3793 Biggio B.
 2152 Bigu-Del-Blanco J.
 2172 Bigu-del-Blanco J.
 3233 Bijman J.
 377 Bilaniuk L.T.
 2719 Bilaniuk L.T.
 3757 Bilaniuk L.T.
 3758 Bilaniuk L.T.
 3728 Bilger R.C.
 621 Bilinsky R.T.
 2785 Billard L.
 839 Billard M.
 3730 Billings B.L.
 900 Bilsen F.A.
 2240 Binder P.S.
 307 Binder W.
 2726 Binder W.
 3812 Binder W.
 2 Bingham D.N.
 2631 Binkhorst C.D.
 1846 Binkhorst R.A.
 2804 Biocca M.
 1000 Biot B.
 988 Birck H.
 2120 Bird R.
 2751 Bird R.M.
 747 Birdi H.
 1721 Birkemeier W.P.
 1534 Birks L.S.
 1832 Biron R.
 2370 Biron R.
 2110 Bisang J.
 768 Bischof C.J.
 3460 Bischof C.J.
 2300 Bishop R.P.
 2113 Biswas B.N.
 3022 Bjarngard B.E.
 3314 Bjerkedal T.
 371 Bjorgen J.E.
 1457 Bjork V.O.
 594 Bjorkholm P.J.
 3339 Bjorkroth B.
 638 Bjorno L.
 1348 Bjorno L.
 3363 Black A.K.
 1286 Black F.O.
 3728 Black F.O.
 3841 Black F.O.
 38 Black J.
 1858 Black J.L.
 3829 Black J.L.
 3341 Black R.
 2364 Blackmon L.
 2825 Blaivas A.S.
 50 Blake J.R.
 2018 Blake N.J.
 327 Blamey R.W.
 21 Blaschke T.F.
 140 Blaseio G.
 494 Blatt F.J.
 1424 Blau M.
 2819 Blauert J.
 2979 Blegvad B.
 1986 Bleifeld W.
 67 Blest A.D.
 1678 Blick E.F.
 1938 Blincoe C.
 3115 Bliokh Zh.L.
 2145 Blit S.
 1756 Block G.D.
 899 Block M.G.
 88 Block P.
 2558 Blocker W.
 2622 Blom G.
 1568 Blomqvist P.
 1944 Blondeau P.
 128 Bloom A.
 2863 Bloom G.P.
 2645 Bloom J.D.
 683 Bloom P.J.
 2991 Bloomfield S.E.
 2916 Bloor C.
 3472 Bluemel G.
 2958 Bluemlein H.
 1567 Blum B.I.
 2391 Blume J.
 1250 Blumenson L.E.
 2555 Blumenthal M.
 1512 Blumstein S.E.
 68 Boag J.W.
 3304 Bobbaers H.
 3509 Bobisud L.E.
 1662 Bock O.
 3213 Bockemohle L.P.
 2161 Boddy K.
 3256 Boddy K.
 2555 Bodenheimer J.
 1952 Bodenstein G.
 1838 Bodily S.E.
 2224 Boe C.
 3180 Boeckmann R.D.
 1836 Boesby S.
 560 Boguslavskii L.I.
 1870 Bohadana A.B.
 1698 Bohdanecky Z.
 3174 Boheim G.
 3549 Boheim G.
 1033 Bohlman T.W.
 2691 Bohuon C.
 3405 Bohuon C.
 188 Bolden R.C.
 1958 Boles M.
 729 Bolmsjo M.S.
 3199 Bolmsjo M.S.
 3090 Bolte H.D.
 2893 Bolton N.E.
 3265 Bolyky J.
 328 Bolz U.
 1009 Bon M.
 3213 Bond D.A.
 1066 Bond E.L.
 54 Bond Z.B.
 3477 Bones P.J.
 368 Bongiovanni G.
 880 Bongiovanni G.
 1541 Bongiovanni G.
 3405 Bonnay M.
 987 Bonnerot G.
 2528 Bonnerot G.
 2048 Bonnet Cl.

- 1799 Bonouvrie H.J.
942 Book S.A.
2110 Borbely A.A.
2111 Borbely A.A.
1762 Bordoni F.
2422 Borejdo J.
1035 Borge J.
352 Borgstedt A.D.
3294 Borgstrom P.
3826 Borlaza G.S.
2628 Bormann B.
3452 Boroff R.D.
1782 Borth R.
2916 Borun R.
1506 Bosatra A.
3564 Bosch F.
662 Bosl R.H.
3136 Bosma R.
355 Bossard F.
774 Bostem F.
3009 Boster R.A.
3049 Bosworth R.
3459 Bottomley P.A.
3659 Bottreau A.M.
406 Bouckaert A.
1663 Boughner D.R.
1546 Boulton T.B.
1690 Bouman M.A.
1142 Bourland J.D.
3697 Bourland J.D.
3333 Bourne J.R.
3519 Bousquet A.
1373 Boutin N.
3054 Bouvrain Y.
471 Bowden N.L.R.
2366 Bowie J.
2682 Bowie J.
3333 Bowling P.S.
3007 Bowman B.M.
3795 Bowyer D.E.
396 Boyarsky A.
486 Boyarsky A.
884 Boyarsky A.
1646 Boyarsky A.
832 Boyd D.
3445 Boyd D.
2531 Boyd W.R.T.
3387 Boyer A.L.
3519 Boyer P.
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2427 Boykin W.H. Jr.
1503 Boyles D.L.
1889 Boynton R.M.
1023 Boys J.
1698 Bozkov V.
407 Bozler G.
408 Bozler G.
411 Bozler G.
550 Brace R.A.
1704 Brace R.A.
2400 Brace R.A.
1592 Bracewell R.N.
3165 Bracken A.J.
2794 Bradley E.L.
2239 Bradley P.J.
1876 Bradley W.E.
1665 Bradley W.G.
998 Braga P.C.
656 Bragg D.G.
1064 Bragg D.G.
3454 Bragina L.K.
525 Brahne I.
2445 Braida L.D.
3533 Braida L.D.
841 Brame R.G.
1019 Brammer A.J.
3575 Brand J.R.
176 Brand L.
1980 Brandeys J.F.
3708 Brandestini M.
226 Brandt S.
1976 Brasching H.
1617 Brassard J.R.
562 Brasseur L.
2278 Brateman L.
2657 Brateman L.
2658 Brateman L.
3665 Brateman L.
1623 Brauer G.M.
427 Braun B.
3651 Braun Falco O.
364 Braun I.F.
302 Braunsfurth J.S.
1166 Bravo Fernandez E.J.
1949 Bravo Fernandez E.J.
1607 Breedlove R.
1185 Breiman R.S.
2726 Breit A.
3831 Breitling G.
279 Brekelmans F.E.M.
2030 Bremble G.R.
546 Bremhorst K.
577 Brendel K.
1440 Brengelmann G.L.
797 Brennan M.F.
1603 Brennan T.G.
1198 Brenner D.J.
2307 Brenner J.F.
3796 Brenner L.
2331 Breslow N.
435 Brew W.K.M.
3017 Brezovich I.A.
3374 Brezovich I.A.
2745 Bridger D.A.
1413 Bridges J.M.
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839 Briet S.
2047 Brigner W.L.
3671 Brill A.B.
2072 Brill M.H.
2847 Brill M.H.
1335 Brinck W.
1486 Brindley G.S.
997 Brink P.
2575 Brinkmann G.
848 Brinkmann K.
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3208 Brinkoff H.C.
804 Brismar K.
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2460 Britton K.E.
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3216 Broad D.J.
1876 Brockway B.P.
984 Brodersen R.W.
112 Brodie J.H.
263 Brodrick J.D.
3661 Brodwin M.E.
2324 Brohet C.R.
915 Bromberg P.A.
1662 Bromm B.
810 Bronskill M.J.
3383 Bronskill M.J.
2382 Bronzino J.D.
3481 Bronzino J.D.
3833 Brookeman V.A.
231 Brooks A.G.F.
3703 Brooks J.
3231 Brooks R.
1602 Brooks R.A.
2694 Brooks R.A.
2725 Brooks R.A.
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3424 Broughton R.
3503 Broussard J.R.
2112 Brower E.
1233 Brower R.W.
133 Brown A.C.
3680 Brown C.
141 Brown E.T.
1360 Brown F.A.
2576 Brown J.H.U.
3543 Brown J.M.
3224 Brown J.N.
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357 Brown L.R.
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1914 Brown R.
203 Brown R.C.
1027 Brown S.M.
1029 Brown W.S. Jr.
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2992 Brubaker R.F.
2926 Brubakk A.O.
3757 Bruce D.
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1994 Bruce E.N.
538 Bruckert R.
2084 Bruckstein A.M.
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1067 Brueschke E.E.
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1351 Brummer A.
1490 Brummer S.B.
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2228 Brummer S.B.
2269 Bruneel C.

- 2258 Brunner F.
 173 Bruscaaglioni R.
 1504 Bruschini P.
 2529 Bruun G.
 3727 Bruzzzone S.
 2869 Bryan J.K.
 30 Bryan M.E.
 786 Bryan P.J.
 3449 Bryan P.J.
 2645 Bryan R.S.
 2574 Bucaro J.A.
 1057 Buchholz C.
 278 Buchinger R.
 3377 Buchler D.A.
 3483 Buchsbaum M.S.
 2583 Buchwald S.E.
 3606 Buck J.R.
 847 Buckley D.J.
 1177 Budinger T.F.
 1971 Budkin A.
 3463 Budkin A.
 1545 Buehring W.J.
 1183 Buell U.
 2717 Buell U.
 2080 Bukauskas F.F.
 3197 Bukauskas F.F.
 3302 Bukauskas F.F.
 1423 Bukhari S.J.H.
 2741 Bukovitz A.G.
 3025 Bukovitz A.G.
 2949 Bullen H.G.
 2695 Buller A.C.
 1326 Bullock J.O.
 2723 Bulski W.
 1102 Bumm P.
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 3234 Burbank D.P.
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 233 Burch D.E.
 529 Burch J.J.
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 1200 Burdine J.A.
 1002 Burgar C.G.
 1082 Burger D.
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 724 Burgess A.E.
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 1518 Burke R.S.
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 454 Burkhardt S.
 1272 Burlin T.E.
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 3237 Burne J.A.
 1897 Burnett E.D.
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 1453 Burres K.P.
 3800 Burrows R.
 2919 Burstone C.J.
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 2222 Burton J.H.
 185 Burum D.P.
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 3386 Bushong S.C.
 3207 Busis S.N.
 147 Busse R.
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 3687 Butler R.
 1510 Butler R.A.
 221 Butruille Y.
 574 Button K.J.
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 1722 Buys J.D.
 2236 Buzsaki G.
 78 Buzukin V.G.
 1090 Byrne D.
 1520 Byrne D.
 484 Byzov A.L.
 2844 Byzov A.L.
 307 Cabaj A.
 3361 Cabe P.A.
 3371 Cacak R.K.
 1439 Cadogan J.B.
 543 Cadzow J.A.
 3534 Caelli T.
 2460 Cage P.E.
 1639 Caianiello E.R.
 787 Caille J.M.
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 1813 Cain S.M.
 3830 Caird F.I.
 625 Cairns J.W.
 3829 Cala L.A.
 1672 Caldesi-Valeri V.
 2173 Caldwell W.M.
 537 Calhoun R.R.
 3815 Callen P.W.
 1077 Caltagirone C.
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 384 Cameron H.U.
 2381 Cameron J.M.
 1311 Cameron W.H.
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 1587 Campbell J.K.
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 2449 Champion R.C.
 3353 Cancura W.
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 1483 Canfield T.
 1656 Canfield T.
 215 Canham P.B.
 1080 Canham P.B.
 310 Cannon M.
 367 Cannon M.
 1624 Cannon S.L.
 2551 Canonne C.
 3296 Cant J.R.
 2264 Cantrell J.H. Jr.
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 2536 Caplin M.L.
 3854 Capowski J.J.
 1055 Capra N.F.
 135 Caprihan A.
 1715 Caprihan A.
 907 Caprio J.R.
 3268 Carette B.
 1985 Carey B.J.
 2978 Carhart R.T.
 650 Carinhato J.D.
 170 Cariou J.
 1736 Carius W.
 630 Carlson R.G.
 2582 Carney A.E.
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 155 Carome E.F.
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 1461 Carpentier A.
 1684 Carquille B.
 36 Carrat R.
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 3439 Carrl J.M.
 365 Carroll B.A.
 334 Carroll D.I.
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 93 Carson P.L.
 2358 Carson P.L.
 58 Carstensen E.L.
 1828 Carstensen E.L.
 801 Carter B.L.
 1903 Carter D.R.
 207 Carter K.B.
 1038 Casali R.
 1008 Casasent D.
 3226 Casasent D.
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 2099 Castellano A.
 1548 Castillo H.T.
 941 Cataldo D.A.
 1268 Cataloglu A.
 1082 Catani P.
 1485 Cathey M.
 1121 Cavagna G.A.
 2943 Cave F.D.
 927 Cecchini A.
 2512 Ceglie N.M.
 3591 Celaya L.
 3725 Celebi G.A.
 1721 Celesia G.G.
 3113 Celeste R.
 3798 Cembrowski G.S.
 214 Cerdonio M.
 2888 Cerimele D.
 623 Cerny L.C.

2479 Cerrato L.R.	3588 Chen H.	1463 Christopher R.A.
319 Cestone K.J.	3608 Chen J.	2938 Christopherson R.J.
1135 Cestone K.J.	2178 Chen K.-M.	728 Chu G.
2532 Cetas T.C.	2275 Chen K.M.	1201 Chu W.K.
3525 Cetas T.C.	3064 Chen K.Y.	2911 Chu W.K.
1360 Chadwick J.H.	3307 Chen P.H.	3102 Chu W.K.
2427 Chaffin D.B.	3557 Chen T.C.	616 Chuich G.A.
698 Chagneux H.	3403 Chen T.T.	3379 Chuiiko G.A.
2467 Chagneux H.	414 Chen Y.	3496 Chun K.S.
698 Chagneux R.	2842 Chen Y.	2731 Churchill R.J.
484 Chailahian L.M.	2068 Cheng C.J.	2506 Churg A.K.
3297 Chaivre J.	1361 Cheng E.M.	2706 Cinca I.
2530 Chakravarty R.K.	2456 Cheng L.C.	3343 Cinotti A.A.
698 Chalazonitis N.	906 Cheng M.J.	857 Cinquini G.
3250 Challand G.S.	2895 Cheng S.W.	792 Citrin C.M.
3772 Chalmeton V.	2900 Cheo P.K.	3201 Civan M.M.
1594 Chamberlain C.C.	428 Cherneikin V.A.	646 Claasen W.
2733 Chamberlin K.	2052 Cherniack N.S.	3237 Clack D.J.
3586 Chambers B.	398 Chernik N.L.	1006 Claesson S.
3601 Chambers R.W.	3152 Chernitsky E.A.	1517 Clahane A.C.
2564 Chamness A.F.	1054 Chernoff E.	2636 Claivaz J.F.
2579 Chamness A.F.	1176 Chesler D.A.	1711 Clark C.
499 Chan S.K.	489 Chetayev A.N.	1264 Clark C.R.
1205 Chan Y.S.	2834 Chetayev A.N.	9 Clark C.W.
923 Chandra R.	3088 Cheung S.	1023 Clark G.
1201 Chandraratna P.A.N.	221 Chevallet J.	3341 Clark G.M.
189 Chandraselhar R.	1906 Chi-Wu Chang	1718 Clark H.R.
3664 Chaney E.L.	3189 Chiang C.	1112 Clark J.A.
2524 Chang S.L.	1703 Chiang C.L.	1066 Clark J.S.
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2520 Chansler R.J. Jr.	2814 Chibrikin V.M.	932 Clark J.W.
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42 Chao E.Y.S.	352 Chik L.	479 Clark J.W. Jr.
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1660 Chapman A.E.	2892 Childress J.J.	2177 Clark R.E.
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1710 Chapoy L.L.	1865 Chin Hu Feng	2431 Clarke J.R.
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3390 Charles A.	968 Chitre S.	764 Clarke W.
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2526 Chatterjee B.	3172 Chow F.W.	2904 Cliff K.D.
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2465 Chau N.	1478 Chretien J.	177 Cline J.W.
2749 Chau N.	3417 Christ G.	1908 Clot J.
1069 Chauser B.M.	3831 Christ G.	3018 Co E.D.
2830 Chauvet G.	3313 Christensen A.	203 Coakley W.T.
1388 Chavance M.	909 Christensen R.L.	1332 Coates G.
2441 Cheatham M.A.	794 Christiansen J.	594 Cobb C.M.
3556 Chelidze T.L.	2219 Christiansen R.W.	652 Cobbold R.S.C.
726 Chemtob M.	314 Christie P.F.	2602 Cobbold R.S.C.
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 595 Cronquist A.G.
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 2673 Crosby B.C.
 2896 Cross P.S.
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 3721 Crowe W.
 217 Crowley A.
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 3545 Crump K.S.
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	1577 Davis K.R.	631 Defeyter P.J.
	2729 Davis K.R.	1921 Degerine S.
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1672 Da Ronch A.	2367 Davis L.S.	3520 Dehoff P.H.
2135 Da Silva K.M.C.	3778 Davis L.S.	3606 Deisenroth M.P.
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2967 Daan S.	2653 Davis P.R.	1753 Del Presto P.V.
2556 Dahlke G.	1916 Davis V.L.	1857 Delabre M.
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318 Dale R.A.	2225 Dawids S.	3659 Delbos G.
2006 Dalgleish L.	283 Dawihl W.	3840 Delcaro L.
3840 Dalla Palma L.	896 Dawson D.C.	3702 DeLeon A.C. Jr.
998 Dall'oglio G.	2482 Dawson D.J.	3241 Delettrez B.
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3670 Dalton D.R.	1714 Dawson S.V.	2626 Delgado J.M.R.
1041 Damato A.N.	1489 Dawson W.W.	2768 DeLisi C.
3481 D'Amato D.P.	1406 Day G.W.	2777 DeLisi C.
1928 Dammann H.	3462 Day R.E.	161 Della Croce U.
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2723 Danczak Z.	748 De Bakker J.M.T.	2635 Delori F.C.
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916 Daniels E.	3154 De Boer E.	466 Dembo M.
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2853 Danos M.	1133 de Brandt H.M.	166 Demong N.J.
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741 Darai S.	3760 De Carvalho A.	2866 Denby E.F.
2868 Darcos M.	2112 De Castro J.M.	2246 Denieul P.
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1670 Davidson C.L.	2049 De Marco A.	1818 Deschamps P.
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 505 Dyhre Poulsen P.
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 334 Dzidic I.

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 453 Eimas P.D.

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 174 Emmony D.C.
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 502 Fauceoglio J.J.
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3789 Friehs G.	2406 Galand P.	295 Gazenko O.G.
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1143 Frohmueller H.G.W.	446 Galoyan V.R.	254 Geeraets W.J.
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3285 Fronck A.	1750 Ganguly U.S.	2860 Gehring K.
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2128 Fukutome S.	3306 Garred L.J.	1092 Gerken G.M.
2521 Fuller S.H.	626 Garrioch D.B.	844 German J.C.
2951 Funahashi A.	142 Garrow B.	280 Germans F.H.

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 23 Gillepsie D.T.
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3294 Grande P.O.	1975 Griver J.	3185 Gusev V.M.
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3733 Grant W.M.	2547 Gross G.W.	1149 Gustafson D.H.
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211 Gray A.H. Jr.	3592 Gross J.G.	3179 Gustafsson B.
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2419 Gray B.F.	3061 Gross Selbeck G.	1340 Gutman A.
3352 Gray G.P.	3717 Grosspietzsch R.	2461 Gutman A.
1443 Gray J.H.	819 Grote W.	2469 Gutman A.
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145 Green G.W.	3786 Gruner S.M.	1221 Gyldensted C.
3479 Green M.	3701 Grunewald W.A.	2727 Gyldensted C.
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1061 Kleisbauer J.P.	644 Koide T.	761 Kovant A.
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2273 Klemp P.F.B.	2206 Koivula A.	1977 Kowalski G.
3789 Klepp G.	3174 Kolb H.A.	3670 Kowalsky R.J.
1992 Kless H.	3549 Kolb H.A.	2891 Koyama T.
1922 Klevenhagen S.C.	1655 Kolba D.P.	2438 Kozemchak C.
3563 Klevenhagen S.C.	632 Kolesova O.Ye.	3038 Koziol J.
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1362 Klijn J.A.J.	2599 Kolin A.	2971 Kraemer G.W.
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3153 Klinger H.G.	3446 Kolind A.	885 Krag M.H.
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3717 Klink F.	794 Kollarits C.R.	3700 Krahenbuhl B.
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2794 Klip W.	3067 Kollins S.A.	1549 Krajewski J.
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3407 Kratt E.
136 Kraus K.
3226 Kraus M.
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2677 Krause H.E.
3762 Krause K.
546 Krebs L.
956 Krebs P.
1986 Krebs W.
1252 Kreid D.K.
1206 Kressel H.Y.
1682 Kretschmar J.
817 Kretzschmar K.
3814 Kretzschmar K.
758 Kreul J.F.
2547 Kreutzberg G.W.
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3457 Kricheff I.I.
1603 Krishna Rao C.V.G.
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3423 Lancaster M.C.
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3240 Landsman M.L.J.
3401 Landwehr G.
365 Lane B.
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3381 Lane R.G.
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3019 Lang G.
2787 Lange K.
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350 Langewouters G.J.
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2229 Lansky P.
294 Lantis S.D.H.
342 Lantz B.M.T.
300 Lanzi L.H.
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1249 Lardner T.J.
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1590 Larsen L.E.

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3798 Larson F.C.	796 Leeds N.E.	965 Levander Lindgren M.
523 Larson S.J.	1188 Leeds N.E.	616 Leventhal V.I.
3035 Larsson S.	1596 Leeds N.E.	1791 Leventhal L.A.
2897 Lash H.	3438 Leeds N.E.	1411 Leventhal M.
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2208 Lassen N.A.	1025 Leeman S.	158 Levett J.
3388 Laszlo C.A.	100 Leeming M.N.	248 Levi S.
2340 Latchaw R.E.	3305 Leene W.	1565 Levi S.
3079 Latchaw R.E.	1393 Lees H.	2231 Levin A.B.
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2471 Latorre R.	1119 Lefton M.	2057 Levine D.Z.
2301 Latt S.A.	1502 Legendy C.R.	3458 Levine H.
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754 Lau A.	2749 Legras B.	3388 Levine M.D.
3043 Laude G.	3804 Legras B.	2046 Levine M.W.
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1552 Lauersen N.H.	1622 Lehmann M.	3367 Levison W.H.
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3537 Laughlin S.B.	2355 Lehtinen E.	91 Levitt D.G.
2993 Laumer R.	1734 Leibovic K.N.	3117 Levitt D.G.
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1812 Lavoie A.	1989 Leinbach R.C.	3456 Levitt S.H.
2940 Lavoie A.	1132 Leininger V.	1937 Levy A.F.
3527 Lawrence W.F.	1013 Leitgeb N.	3403 Levy A.H.
1043 Lawrie G.M.	2660 Leitgeb N.	2690 Levy J.P.
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2976 Laxminarayan R.	2423 Leitmannova A.	1935 Levy N.M.
2976 Laxminarayan S.	427 Lemke R.	1293 Levy Schoen A.
1942 Lazzara R.	871 LeNeveu D.M.	1524 Lew W.D.
3659 Le Petit J.P.	137 Lengyel M.W.	3614 Lewandowski M.
2491 Le-Huy H.	1073 Lenn N.J.	952 Lewis A.V.
3640 Leach M.O.	1600 Leo F.P.	985 Lewis D.G.
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1989 Leavitt M.B.	2220 Leonard R.T.	570 Lewis S.M.
1478 Lebeau B.	3437 Leonardi M.	1128 Lewis V.E.
88 Lebedelle M.	212 Leopold H.	1920 Lewis V.E.
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969 Lebedev V.	1642 Leppard P.	2644 Lhermerout C.
92 Lecar H.	3803 Lepper R.-D.	996 Lhotsky S.
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3393 Lecky J.H.	2359 Lerch I.A.	3711 Liao N.S.
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2336 Ledley R.S.	1382 Leroy A.F.	3351 Liberman M.Y.
3843 Ledley R.S.	420 Lesk A.M.	163 Lieberman M.
1636 Lednitskii D.G.	3517 Lesker P.A.	578 Lieberman R.L.
2053 Ledvinova A.	1402 Leskovar B.	3072 Liebeskind A.L.
711 Lee A.S.J.	1403 Leskovar B.	2475 Lieblich I.
1072 Lee B.B.	721 Leslie J.	3104 Liedtke C.E.
711 Lee C.	3399 Leslie W.G.	337 Lienert G.A.
3716 Lee H.H.	1221 Lester J.	1130 Liesem H.
3456 Lee J.M.F.	1361 Leung A.M.	1151 Lieske C.N.
3623 Lee J.S.	2248 Leung L.S.	1052 Ligtvoet C.
336 Lee K.L.	3373 Leung P.M.K.	1585 Liliequist B.
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162 Lilley E.
 387 Lim J.J.
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 14 Lin J.
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 383 Lindsay R.M.
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 281 Lippert F.G.
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 22 Little W.A.
 202 Littlefield R. Jr
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 81 Lopes Da Silva F.H.
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 1840 MacAlpin R.N.

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1067 Mayerhofer K.
3721 Mayevsky A.
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1296 Mazzone R.W.
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740 Newhouse V.L.
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1202 Newman S.E.
3800 Newmark H. III
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22 Ng K.O.
241 Ng K.T.
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2763 Nicolis J.S.	3828 Nuesse W.	2063 Olsen C.F.
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3219 Nielsen H.B.	813 Nuzzo G.	3662 Olsen R.G.
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442 Nielsen T.M.	1568 Nygards M.E.	2800 Olson R.J.
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396 Noble P.B.	3243 Ogiwara H.	3533 Oppenheim A.V.
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52 Nordmark J.O.	1885 Ohsawa K.	217 O'Rourke M.F.
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3263 Northeved A.	390 Okun' I.M.	2675 Osborn J.J.
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19 Nossal R.	674 Olgart L.	1834 Osterhammel P.
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 339 Petkova E.
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 2828 Piiper J.
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 2006 Pike R.
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 384 Pilliar R.M.
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 333 Pino I.
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 1952 Praetorius H.M.
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 832 Price D.
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3083 Reinstein L.E.
527 Reite M.
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773 Remond A.
777 Remond A.
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3442 Renaud Salis J.L.
1003 Reneau D.D.
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3073 Retif J.
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1856 Reul H.
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87 Rey W.J.J.
3786 Reynolds G.T.
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185 Rhim W.K.
3271 Rhodes M.
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607 Rice D.P.
3326 Rice F.L.
1024 Richard B.
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1355 Richardson C.
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385 Rijke A.M.
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983 Ring C.
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2702 Rios J.
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433 Ritman E.L.
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3844 Robbins A.H.
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2996 Robinette L.
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761 Robinson E.
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182 Robinson F.N.H.
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809 Rockoff S.D.
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1881 Roeder U.
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374 Roger F.H.
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415 Romanin Jacur G.
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 338 Samson M.
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 696 Trautmann M.
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 1333 Treves S.
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 903 Tribolet J.M.
 3028 Trider R.C.
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 1556 Trieglaff A.
 3803 Trier H.G.
 484 Trifonov Y.A.
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 1114 Tsubuku M.
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 2473 Urthaler F.
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 398 Ushio Y.
 295 Uskov F.N.
 514 Usunov I.S.
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 1091 Van Der Heijde G.L.
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 703 Van Noorden L.P.A.S.
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 1918 Wee W.G.
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 333 Weeramantry A.
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 819 Weichert H.Ch.
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 928 Weidlich E.
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 1351 Weihrauch T.R.
 2711 Weil M.H.
 2500 Weiler H.
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 1193 Weir B.
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 2435 Weiss G.H.
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 956 Wells R.
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 1341 Wendhausen H.
 1992 Wendisch D.
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 94 Wenger P.
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 278 Werner E.
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 118 Wertz R.
 1881 Wess O.
 44 Wesseling K.H.
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 363 Westbrook E.L.
 1934 Westenskow D.R.
 2474 Westerfield M.
 2212 Westermann K.
 1936 Westman Naeser S.
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 147 Wetterer E.
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 912 Wevelsiep K.
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 1273 White A.A. III
 727 White D.R.
 2928 White D.R.
 850 White G.M.

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1600 White R.I. Jr.	2307 Williams H.	2353 Winter J.
526 White R.L.	2577 Williams J.	3040 Winter J.
984 White R.M.	1014 Williams J.M.	3730 Winter M.
3629 White S.H.	3098 Williams M.J. Jr.	351 Wirtschafter D.D.
450 White T.J.	1500 Williams R.	397 Wirtz K.W.A.
1226 White W.	1668 Williams R.	1479 Wirtzfeld A.
3539 Whitefoot H.	194 Williams R.E.	907 Wise J.D.
974 Whitehead C.T.	3794 Williams S.V.	2169 Wise R.H.
3517 Whiteside L.A.	3070 Williamson B. Jr.	1796 Wise S.A.
1419 Whitmire D.P.	3071 Williamson B. Jr.	206 Withers P.C.
3252 Whitmire D.P.	2155 Williamson B.R.J.	3086 Witten I.H.
537 Whitmore R.A.	1794 Williamson I.	1219 Wittenberg J.
2017 Whitmore R.L.	3420 Williamson J.	1604 Wittenberg J.
296 Wichman H.	842 Williamson M.	3451 Wittenberg J.
3802 Wichmann H.E.	1137 Willis B.A.	647 Wittenburg J.P.
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3808 Wickman G.	1955 Willison R.G.	1943 Wojick J.M.
1887 Wickramasekera I.	852 Wills E.L.	2997 Woldoff H.S.
1424 Wicks R.	2866 Wills L.J.	1186 Wolf B.S.
3203 Wideroe R.	3719 Willscher M.K.	1591 Wolf B.S.
2582 Widin G.P.	1863 Willsky A.S.	2319 Wolf H.K.
1156 Wied G.L.	1924 Wilmot D.M.	407 Wolf M.
380 Wiedermann M.	924 Wilmshurst C.C.	408 Wolf M.
2436 Wiegand W.A.	866 Wilsnack R.E.	409 Wolf M.
1172 Wiegman H.	1657 Wilson B.D.	410 Wolf M.
503 Wieland H.	2543 Wilson D.F.	2310 Wolf M.
1570 Wieneke G.H.	1161 Wilson D.H.	1229 Wolfe J.W.
761 Wiener F.	852 Wilson E.M.	1497 Wolfe J.W.
2711 Wiener F.	1761 Wilson G.	3085 Wolff-Terroine M.
454 Wier C.C.	770 Wilson J.	1614 Wolfman E.F.
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767 Wiggli U.	3347 Wilson R.H.	306 Wolke R.L.
2740 Wiggli U.	2148 Wilson T.	2421 Wolner Ch.
899 Wightman F.L.	2505 Wilson T.	801 Wolpert S.M.
3612 Wigley G.	2546 Wilson W.A.	1211 Wolpert S.M.
1289 Wiitanen W.	166 Wiltshcko W.	3299 Wolpowitz A.
280 Wijkmans D.W.	2560 Windawi H.	373 Wolters E.
3657 Wikkerink A.T.B.	1325 Windhorst U.	35 Woltring H.J.
2187 Wikstrand J.	307 Windischbauer G.	680 Womack M.V.B.
1864 Wikswo J.P. Jr.	1103 Windrem E.O.	555 Womastek K.
2590 Wikswo J.P. Jr.	2371 Windsor D.A.	344 Womble M.E.
1238 Wilcox G.L.	881 Winfree A.T.	1773 Womble M.E.
62 Wilcox J.C.	1730 Winfree A.T.	3484 Won Cho D.
2957 Wilde O.	3838 Wing R.W.	1654 Wong A.K.C.
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539 Wiley J.K.	1169 Wingate D.	3524 Wong Y.C.
1968 Wilk J.	3466 Wingert F.	783 Woo K.B.
1665 Wilkes G.L.	3364 Winget J.M.	282 Woo S.L.Y.
1148 Wilkin T.J.	3685 Winkel P.	886 Woo S.L.Y.
976 Wilkinson A.	2294 Winkle R.A.	1265 Woo S.L.Y.
3572 Wilkinson A.B.	2401 Winkler E.	57 Wood C.C.
1965 Wilks R.J.	789 Winkler S.S.	3748 Wood J.D.
2755 Wille S.	790 Winkler S.S.	2107 Wood P.J.
3009 Willems G.C.	2186 Winn R.	2028 Wood R.D.
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118 Willey T.J.	575 Winston R.	2297 Woodbury M.A.
3785 Williams A.R.	3244 Winston R.	3543 Woodcock J.P.
1911 Williams B.A.	1769 Winter D.A.	181 Woodgate J.M.
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1147 Williams G.J.B.	793 Winter J.	1920 Woods J.W.

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 2647 Wunder C.C.
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 829 Wuthrich R.
 710 Wyard S.J.
 3289 Wyatt H.L.

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 488 Yasinovskii V.G.
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 61 Yost W.A.
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 2629 Zahorian S.A.
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 2959 Zajicek G.
 223 Zambraski E.J.
 69 Zamir M.
 447 Zamir M.
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 3785 Zarod A.P.
 1195 Zatz L.M.
 2314 Zauberman H.L.
 2026 Zazworsky R.M.
 1178 Zeddies T.
 2497 Zeedijk H.B.
 1233 Zeelenberg C.
 2328 Zeelenberg C.
 2084 Zeevi Y.Y.
 3329 Zeh D.W.
 568 Zeh R.
 1634 Zeigler B.P.
 303 Zeilinger A.
 1947 Zeitlin G.M.
 827 Zelch M.G.
 3703 Zelin S.
 1485 Zelman A.
 2171 Zelman A.
 198 Zelner L.
 446 Zenkin G.M.
 2632 Zenkin G.M.
 2492 Zervas N.T.
 3548 Zettergerg L.H.
 3116 Zhabotinskii A.M.
 2476 Zhadin M.N.
 3191 Zhuravlev V.L.
 511 Zick G.L.
 552 Zick G.L.
 2140 Zick G.L.
 2202 Zicot M.
 1127 Zielczynski M.
 837 Zielstorff R.D.
 1581 Zilkha E.
 3052 Zilkha E.
 981 Zilske P.
 3097 Zimmer K.
 3321 Zimmer-Hart C.L.
 2735 Zimmerman A.W.
 377 Zimmerman R.A.
 2719 Zimmerman R.A.
 3757 Zimmerman R.A.
 3758 Zimmerman R.A.
 362 Zimmerman R.D.
 629 Zingg W.
 157 Zinn D.E.
 1940 Ziskin M.C.
 3470 Ziskin M.C.
 3362 Zite-Ferenczy F.
 3828 Ziter F.
 2882 Zoellner Ch.
 3853 Zoellner Ch.

758 Zollinger R.M. Jr.
762 Zoltie N.
488 Zubarev T.N.
621 Zucker W.H.
3637 Zuclich J.A.
990 Zuczek R.
2950 Zukaitis M.G.
2345 Zum Winkel K.
1294 Zwart A.
3288 Zweifach B.W.
457 Zwicker E.
2586 Zwitman D.H.
1924 Zylak C.J.
2884 Zywietz Chr.

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